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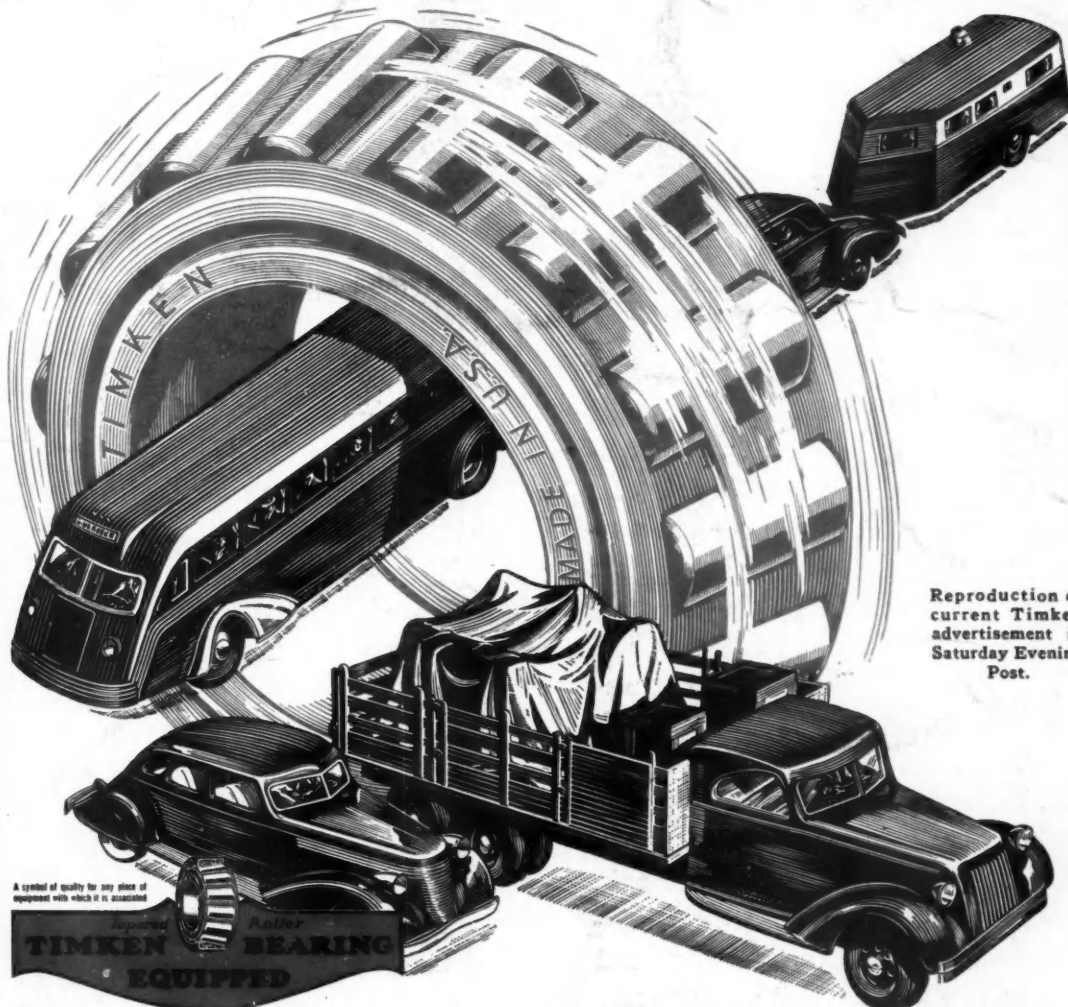
APR 19 1937

AUTOMOTIVE INDUSTRIES

LAND — AIR — WATER

APRIL 17, 1937

TIMKEN Bearings—for outstanding performance in the automotive industry



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Saturday Evening
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EQUIPPED**

You'll find TIMKEN Tapered Roller Bearings on the really tough jobs because they endure. For example—the automotive industry—where TIMKEN Bearings have long been used at hard service points in an impressive majority of makes of automobiles, trucks, buses and trailers. In a wide variety of America's leading and most exacting industries, TIMKEN is the preferred anti-friction bearing. Such an established and diversified record must indicate to you the importance of always insisting on TIMKEN Tapered Roller Bearings when buying automobiles, trucks or buses—road building equipment—mining machinery—agricultural implements—railroad cars and locomotives—and all kinds of modern machinery.

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Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

TIMKEN

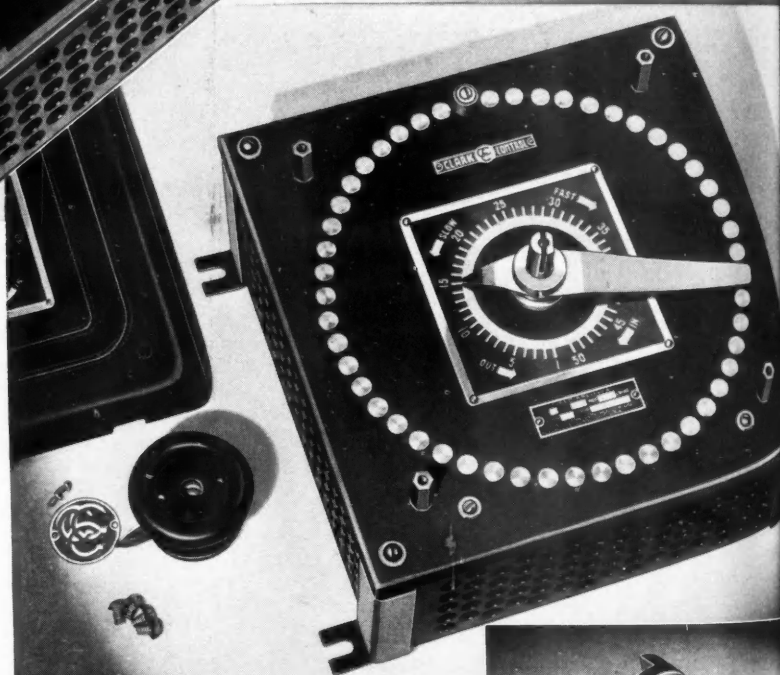
TAPERED ROLLER BEARINGS



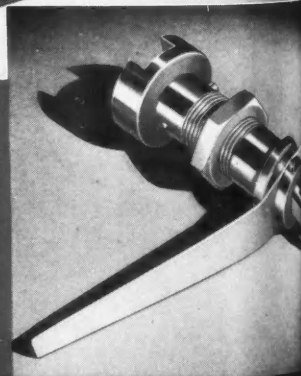
ALL DRESSED UP AND *Going Somewhere!*



TRULY, the Clark Rheostat has been given a new personality. . . . Handsome, some have explained. Note the newly conceived steel cover—streamlined, you might say. Rich black with black Bakelite handle and contrasting red indicator easily read . . . Rugged? Look at that husky shaft—at the diameter of it. Notice the long bearing built to "take it". Strength and long life? Decidedly . . . Accessible. Individual resistor grids are easily replaced and other repairs made. . . . All dressed up is this Clark Rheostat—and destined, we believe, to go somewhere. How about making a visit to your plant very soon?



Note in the illustration above the calibrated position-indicating dial with space for user's marking. Note also at the right the long, sturdy bearing and rugged shaft.



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THE CLARK CONTROLLER COMPANY

1146 EAST 152nd STREET

CLEVELAND, OHIO

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Contents

News of the Industry	575
Business in Brief	580
Calendar of Coming Events	584
A Perliton Pot	585
Style Sells Cars. By H. E. Blank, Jr.	586
New Developments in Automotive Materials	592
Production Lines	597
New Continuous Short-Cycle Annealing Equipment for Malleable Castings	598
Mechanical Drawings of Daimler 8-Cylinder Passenger Car Engine	599
Just Among Ourselves	601
Advertisers' Index	60-61

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Automotive Industries



● Brake failure is no excuse in the eyes of the law.

In many states, the requirements set by law are rigid.

The Tru-Stop Emergency Brake *more than complies with these requirements.* It is a real emergency brake that will stop a heavy-loaded vehicle smoothly and quickly. When braking pressure is applied, every inch of lining makes contact. The result is positive, powerful braking response without noise, chatter or grabbing. The ventilated discs throw off friction heat and thus prevent overheating.

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AMERICAN CHAIN & CABLE COMPANY, Inc.

Manufacturers of the famous Weed
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In Business for Your Safety



TRU-STOP
Emergency
BRAKES

April 17, 1937

Cranks millions of cars
the world over every day!

BENDIX DRIVE



*"The mechanical hand
that cranks your car."*

HERE is a product which, by its faithful, trouble-free performance, has become the world's most widely used automobile chassis unit. Every hour of the day, millions of cars are being automatically cranked by the Bendix Drive. Only Bendix Drive is adaptable to every type of starting control—floor button, clutch or accelerator pedal, dash button or, with Startix,

completely automatic switch-key starting.

Today there is a Bendix Drive engineered for every size and type of automobile, marine and Diesel engine. Renewal parts and complete replacement drives are available everywhere. Also, throughout the United States, a liberal Exchange Plan serves the convenience of motorists and dealers alike.

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ELMIRA, NEW YORK

(Subsidiary of Bendix Aviation Corporation)

AUTOMOTIVE INDUSTRIES

Founded 1895

Vol. 76, No. 16

April 17, 1937

This Week

"Style Sells Cars" is the title of an article which starts on page 586. It is a truth of more than passing interest as well. Again finish is a big part of style. This ought to be enough to make you read it. It contains a lot of important data.

New materials and new ways of using the older materials appearing now, in great part determine the cars of tomorrow. Turn to page 592 and keep ahead of the parade.

The eight-cylinder Daimler engine has some unusual design features. There are drawings of it on pages 599 and 600.

Strike Losses Counted

**Cost of Lost Wages Estimated at \$42,000,000;
First Quarter Car Output Set Back 437,000 Units**

By Harold E. Gronseth

Now that all the automobile manufacturers are back in production, a rough appraisal may be made of the loss in output as the result of strikes since the first of the year. Not even a fair guess can be made of the amount of wages lost since an untold number of workers were laid off in plants indirectly affected. Automobile companies which have been involved estimate that strikes cost their own workers upwards of \$42,000,000. The employees of General Motors are out \$30,000,000; Chrysler, \$10,000,000, and Hudson, \$2,000,000.

The industry's output was set back an estimated 437,000 units on the basis of the operating rate in effect before the strikes, or the tentative schedules that had been established. GM divisions were to have built 450,000 cars and trucks in January and February but actually turned out only 178,235 units, thus missing their schedules by 272,000 units. Chrysler Corp. was averaging 6100 cars and trucks daily before the strike which lost the company 24½ working days. In addition, some time was required to bring production back to the former top rate so that 150,000 units appears to be a fair estimate of Chrysler's lost output on account of the strike. Hudson had been building 600 cars a day and lost 25 working days, or a total of 15,000 cars.

In all probability some of this slack was taken up by companies left free to operate and certainly GM made up some lost time in March when its shipments jumped to 260,963 units, a volume 46 per cent in excess of the total for the first two months. The figure of 437,000 units, therefore, does not represent the amount of production the industry is behind at this time. Nor can this figure be added to the first

(Turn to page 582, please)

Union Begins Drive on Ford

**Upholding of Wagner Act Will Make for Peaceful
Organization of Workers, Say UAW Leaders**

Exultant United Automobile Workers union leaders hailed the Supreme Court's validation of the Wagner Act as they eyed the fertile field it opened to them for organization of Ford workers.

Homer Martin, president, said that the international union would immediately begin a concerted drive among Ford workers. "The Ford employees no longer need fear to join. Henry Ford is not bigger than the U. S. Government. The Supreme Court has spoken; the UAW will act. Mr. Ford will recognize and deal with the UAW even at the price of changing his mind. Others changed their minds, including the Supreme Court.

"The upholding of the constitutionality of the Wagner Act is a definite step forward and in keeping with the spirit and purposes of democracy in the handling of labor relations and labor disputes. Had the labor relations act been effective before, the major strikes in the automotive industry would never have happened.

"We look forward to an era of

peace and quiet in industry, established by legal recognition of the right of labor to organize and bargain collectively," Martin declared.

He said that a strike to force Henry Ford to recognize the UAW will not be necessary now, as the Government will force him to deal with the union.

Ed Hall, second vice-president, said: "We intend to press with all the power at our command the enforcement of this act. Employers will no doubt now recognize the legality of the bill—even Henry Ford."

Henry Ford, who had just returned from his estate in Ways, Ga., was not concerned about the Supreme Court decision on the Wagner Act because its useful provisions, he maintained, have been carried on by the Ford company for some time.

"Our workmen," said Mr. Ford, "are free to do what they wish so far as joining unions is concerned. But I don't know what they could get from our company that they have not already received. We have never had

(Turn to page 578, please)

UAW Splits Ontario

**Ministers Siding with GM Strikers
Resign from Government**

Activities of the United Automobile Workers international union assumed international importance this week and brought about a cabinet crisis in the Ontario government.

Premier Mitchell F. Hepburn, head of the provincial government, who had hitherto been content to protest against the strike in the General Motors plants at Oshawa on the grounds that the organizers were "paid foreign agitators," called on two members of his cabinet to resign unless they were willing to stand with him in his fight

(Turn to page 583, please)

Supreme Court Upholds Wagner Act

Broader View of Constitution's Commerce Clause Leaves Road Open for Further Federal Control of Business

By L. W. Moffett

The Supreme Court of the United States made momentous history April 12 when in five decisions it upheld the validity of the National Labor Relations Act and gave an interpretation of the commerce clause of the Constitution, which gives the Federal Government broad control over manufacturing industry and labor relations. While there are varying views regarding their full implications, it is generally conceded by legal authorities that the decisions are far-reaching and mark a distinct turn toward a "liberalized" attitude of the majority of the Court. In four of the decisions the Court was divided five to four, while in the fifth, relating to the case of the Washington, Virginia and Maryland Coach Co., the decision was unanimous.

One of the cases decided was that of the Fruehauf Trailer Co., but it, like that of the Freedman-Harry Marks Clothing Co., was controlled by principles laid down in the most outstanding case, that of the Jones & Laughlin Steel Corp. The majority opinion was read by Chief Justice Charles E. Hughes, who was joined by Justices Louis D. Brandeis, Harlan F. Stone, Owen Roberts and Benjamin Cardozo. The sharply dissenting minority opinion was read by Justice James M. McReynolds, who was joined by Justices Willis Van Devanter, George Sutherland and Pierce Butler.

Because the majority decisions have upheld the constitutionality of collective bargaining between employees and employers and expanded Federal control over interstate commerce beyond that heretofore exercised, it is expected the administration will now proceed with legislation to establish other forms of Federal control over both industry and agriculture.

The broad interpretation placed on the commerce clause by the majority is seen in its finding that, in substance, all manufacturing industries receiving material from an outside state or shipping their products to another state are engaged in interstate commerce. This is held to be a far cry from traditional court decisions of the past that manufacturing is not interstate commerce and that therefore labor relations in manufacturing industries were not a matter of Federal control. In effect, the

(Turn to page 605, please)

15,865 Pilots, 7629 Planes Now Hold Licenses in U. S.

There were 15,865 pilots and 7629 aircraft holding active Department of Commerce licenses on April 1, 1937, according to an announcement by the Bureau of Air Commerce, Department

of Commerce. On April 1, 1936, there were 14,806 licensed pilots and 7205 licensed aircraft.

The total number of aircraft, licensed and unlicensed, of which the Department had record on April 1, 1937, was 9326, while this number on the corresponding day of last year was 8887. Unlicensed aircraft (bearing identification numbers only) totaled 1697.

Among the 15,865 persons holding pilots' licenses as of the same date were 7178 transport, 860 limited commercial, 7144 private and 683 amateur. The licensed pilots included 445 women classified as follows: Transport, 69; limited commercial, 22; private, 296, and amateur, 58.

Firestone Deadlock Holds Despite Wagner Act Ruling

The Supreme Court's Wagner Act decision throws the six weeks old Firestone-CIO deadlock in Akron, Ohio, into a further state of confusion. Firestone officials, despite the Supreme Court's verdict, have not amended nor modified their original statement that they did not consider as subject to negotiation the demand of the Firestone local, United Rubber Workers Union of the CIO, that it be recognized as the sole bargaining agency for all 10,000 Fire-

stone employees. Union leaders asserted April 13 they would petition the National Labor Relations Board to take steps to compel a ballot of Firestone employees. Over a year ago when the NRLB ordered an employee ballot at Firestone the company filed suit in the Federal Courts and won a permanent injunction against the NRLB.

Whether or not the Supreme Court verdict on the Wagner Act changes the status of this previous ruling, is today a moot subject in tire industry circles. Goodyear similarly has sought to resist the NRLB order for an employee election, and expects final decision soon in its case now pending in the United States Court of Appeals in the District of Columbia.

Prices of Tire Repair Materials Advanced

Practically all tire manufacturers and producers of tire repair and retread materials have advanced prices on repair materials and "camelback," the principal retreading material. The move carries "camelback" to its highest price in history—25 cents a pound on ton lots, and has been a signal for retreaders throughout the country to advance prices on retread and recap jobs and on tire repair work.

Crude rubber prices have softened considerably and have recessed nearly three cents a pound from the peak of 27¼ cents earlier in April. The drop in crude costs has removed, temporarily at least it is believed, any possibility of further tire price increases before mid-summer.

Passenger Car Production by Wholesale Price Classes

(U. S. and Canada)

Two Months 1937 and 1936 Compared

	1937	1936	Per Cent Change	Per Cent of Total	
				1937	1936
\$500 and under	293,963	317,224	- 7.2	46.25	58.19
\$501-\$750	316,960	195,664	+62.1	49.87	35.89
\$751-\$1000	17,816	23,589	-24.4	2.80	4.33
\$1001-\$1500	4,164	6,558	-36.5	.66	1.20
\$1501-\$2000	2,097	1,219	+72.0	.33	.22
\$2001-\$3000	564	869	-36.2	.09	.16
\$3001 and over	47	80	-41.3	...	.01
Total	635,601	545,204	+16.8	100.00	100.00

Truck Production by Capacities

(U. S. and Canada)

Two Months 1937 and 1936 Compared

	1937	1936	Per Cent Change	Per Cent of Total	
				1937	1936
1½ Tons and less	139,072	125,668	+10.8	94.37	94.51
2 to 3 Tons	5,508	5,177	+ 6.3	3.74	3.89
3½ Tons and over	1,854	1,163	+59.5	1.26	.67
Special and Buses	931	968	- 3.7	.63	.73
Total	147,365	132,976	+11.0	100.00	100.00

April 17, 1937

Automotive Industries

Friends of Racing

gathered to unofficially inaugurate "the season" when the Indianapolis Speedway entertained at Dinty Moore's in New York April 5

Photos by Elliott Curtiss, Jr.



(Left) — Taking time out were Steve Hannagan (left) who tells the world about the Indianapolis Speedway and Daniel G. Arnstein, executive vice-president of the Keeshin Transcontinental Freight Lines, Inc.



Ralph De Palma (left), hears what Ted Allen, head of the AAA Contest Board, has to say



(Right) — And here is Ira Vail, once a race driver, now a promoter of racing



(Right) — Graham (the one and only) MacNamee almost stammers as he warms up to his subject



(Left) — Eddie V. Rickenbacker, one-time racer, now vice-president of North American Aviation, Inc., and president of the Speedway Corp., greets old friends



(Above) — "If you —" threatens Fred C. Horner, assistant to vice-president, GM truck



(Right) — Two Ralphs — left, De Palma and right, Hankinson, well-known race promoter



"Pop" Myers, Indianapolis Speedway Manager, turns serious

Union Drives on Ford

(Continued from page 575)

any strikes in our plants because our conditions do not create them."

In reply to a question as to what he would do if union representatives in his plants came to him with demands, Mr. Ford said: "Well, we could say yes or no. And I would be ashamed to have anybody in my plant tell me how conditions could be improved. That has been my job for 20 years."

"Every man in our plant who is a good workman and interested in doing a job knows he is perfectly free at any time to go to his superior about any condition that concerns his work. That has always been our position and the men know this."

Mr. Ford said that he had no idea how many men in his plants belonged to the union. "My advice to the men and to all working men," Mr. Ford declared, "is to keep away from unions. Nobody ever got anything out of the union in the long run, except a few concerns where there was very poor management."

Commenting on the Wagner Act, he said: "It still remains to be seen whether the Wagner Act will work. We have not said the Wagner Act has affected us in one way or the other. I don't see how it can as long as we go ahead as we have in the past."

UAW leaders were of the opinion that the status of the union with companies where agreements already have been made probably would not be affected by the validation of the Wagner Act. Martin said the union would waive its rights under the act to petition for an election in Chrysler plants, expressing satisfaction with the bargaining rights guaranteed in the signed agreement. At this time, the union has no plans for calling any elections. It was pointed out that the law probably would be invoked only in cases

that might come up in the future where the UAW's position was endangered by competing unions, whether old company unions or others.

Frank H. Bowen, regional director of the NLRB in Detroit, regarded the Supreme Court's decision as an aid to industrial peace. He believes that the effect would be to convince both employers and employees that they had a fair and just tribunal in the NLRB to which they could appeal and obtain peaceful adjudication of disputes. There are only two court cases pending in Detroit which involve the jurisdiction of the board, neither in the automotive industry. Bowen expressed the opinion that in the Fruehauf trailer case the company would be required to compensate the discharged employees for the wages lost over a period of two years, probably the difference between what the men would have earned had they remained in the Fruehauf employ and what they actually earned elsewhere after their dismissal.

Packard and Willys-Overland Begin Negotiations with UAW

Representatives of the UAW were to meet with the Packard Motor Car Co. officials April 16 at which time formal demands were to be presented to the company. Richard R. Frankenstein had wired Alvan Macaulay, Packard president, stating: "Confirming our telephone conversation of this date, it is understood that the International Union of UAW will meet with you and your representatives at 2 p. m., Friday, at the Packard plant to formally present demands on behalf of your organized workers."

The union was negotiating this week with Willys-Overland with the view of replacing a verbal agreement which has been in effect since last fall by a written contract. The union claims to represent 92 per cent of the Willys-

Overland workers and is asking sole bargaining rights in that plant. No wage demands are said to be involved.

It required the combined force of 310 police and 54 sheriff deputies to evict 120 sitdown strikers from the plant of the Yale & Towne Manufacturing Co. in Detroit April 14. Strikers threw lead weights from the roof and from behind barricades and received in return tear gas bombs from the police. After half an hour of fighting the strikers were forced to leave the gas-filled plant. Several received minor injuries. All were taken to the police station in patrol wagons and placed under arrest. Bonds of \$100 for the men and \$50 for women were required by Circuit Court Judge Arthur Webster and were supplied by the union. Hearings on contempt charges were postponed to April 26 and bonds were reduced to \$50 for men and \$25 for women.

The 25-day strike at the Chris-Craft Corp. plant at Algonac, Mich., was settled April 14 when an agreement was reached with the UAW after a week of negotiations. The agreement provides for UAW recognition for members, minimum wages of 50 cents an hour, eight-hour day and 44-hour week, and establishment of seniority.



H. W. SHEPARD, veteran Cleveland automobile executive, has been named general manager of the Cadillac-LaSalle factory branch in Detroit to succeed C. W. Hathaway, deceased.

R. F. KENNEY, formerly sales manager of the Cadillac-LaSalle branch in Cleveland, has been appointed manager of the branch.

PAUL FITZPATRICK, who organized and managed the General Motors Acceptance Corp., and later served as an official with the Commercial Investment Trust, Pierce-Arrow and the Credit Alliance, has become vice-president of the First New Amsterdam Corp.

VERN R. DRUM, former president of the Hupp Motor Car Corp. and for 10 years in charge of operations at the Chrysler-Jefferson plant in Detroit, has been elected president of Logan Gear Co., succeeding W. H. Schomburg, resigned.

FRANK H. JOYCE, general manager of the Alms Trailer Co. for the past several months, has been elected president to succeed William H. Redman, resigned.

Studebaker "Wheel" Awarded Prize as Best House Organ

Top honors in the annual house organ competition have been awarded to the *Studebaker Wheel*, according to an announcement just made in New York by officials of the direct mail publication, *Postage and Mailbag*. More than two thousand publications representing industrial and commercial organizations in the United States, Canada and abroad, were entered in this contest.



Acme photo

Popularity of tourist trailers on the Pacific Coast was evident in the recent show held in Los Angeles, a general view of which is shown here.

Reo Sticks to Trucks

Eastern Stockholder Group Agrees to Present Management's Policy

Settlement of differences on stock representation on the board of directors of the Reo Motor Car Co. was claimed this week in Lansing by Walter S. Foster, attorney for the corporation.

Complete harmony between the present management and a group of Eastern investors headed by Frank Vanderlip, Jr., of New York, was reported. He said that under the agreement reached, the board will be increased from five to nine members, with the additional directors representing the common stock holdings of the Eastern group.

Two of Reo's new directors, according to Mr. Foster, will be Mr. Vanderlip and Herbert Wilson Smith of the Union Carbide Co. of New York. The additional directors will be named at the annual meeting of stockholders to be held in Lansing April 20. Mr. Foster said it was agreed that the future of Reo is in the commercial car field. A previous announcement by the Eastern group expressed their desire for Reo to re-enter the passenger car field.

The settlement brought to a close a brief proxy battle that followed announcement from New York by Mr. Vanderlip of the acquisition of a considerable block of common stock by himself, his father, and a group of Eastern associates. An independent stockholders' committee was formed with Byron Ballard of Lansing as attorney.

With the Reo strike settled, production at the factory was resumed this week, just five weeks after the sit-down strike halted all operations. Hundreds of workers returned to their jobs Wednesday.

Reo workers affiliated with the United Automobile Workers of America approved a contract with Reo at a meeting held April 13.

March Rubber Consumption 24% Higher than Year Ago

Consumption of crude rubber by manufacturers in the United States for the month of March is estimated to be 52,938 long tons, which compares with 50,282 long tons for February. March consumption shows an increase of 5.3 per cent over February and is 24 per cent above March a year ago according to statistics released by the Rubber Manufacturers Association. Consumption for March, 1936, was 42,703 long tons.

This organization reports gross imports of crude rubber for March to be 52,039 long tons, an increase of 20.2 per cent over the February figure of 43,289 long tons and 39 per cent over the 37,451 long tons imported in March, 1936. Total domestic stocks of crude

rubber on hand March 31 are estimated at 191,618 long tons, which compares with Feb. 28 stocks of 193,864 long tons and 276,823 long tons on hand March 31, 1936.

Crude rubber afloat to U. S. ports as of March 31 is estimated at 56,994 long tons which compares with 53,538 long tons afloat Feb. 28 and 58,935 long tons afloat March 31 a year ago. March reclaimed rubber consumption is estimated at 15,393 long tons, production 14,462 long tons, stocks on hand March 31, 30,277 long tons.

:SLANTS:

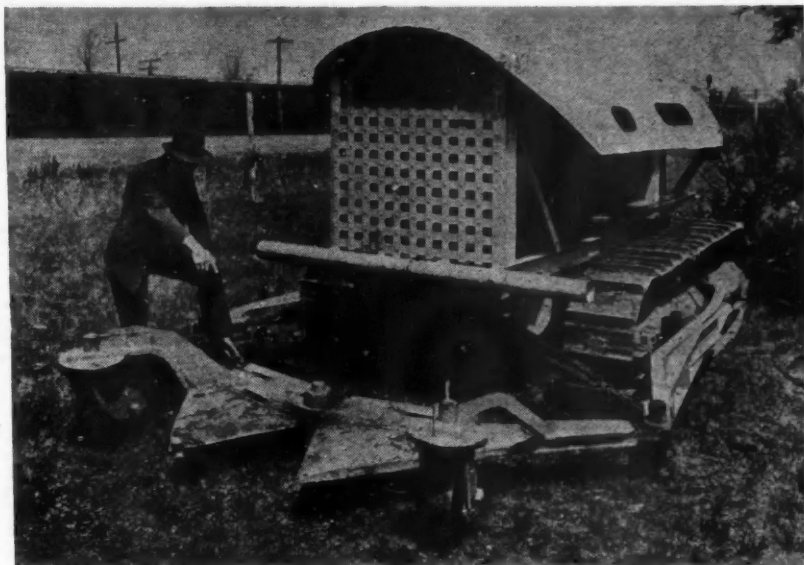
NOT POLITICAL—Chosen 'way back in the peaceful 'twenties, the name "Dictator" has recently brought criticism to the Studebaker Corp. from owners who think that events of the past few years have made it "un-American" and unworthy of "such a fine car." Replying to such accusations, the company recently ran a test advertisement in a Chicago paper. "We regret this irritation of some of our friends," the copy read. "Is it unpatriotic for a young fellow to speak of his girl as a 'queen'? . . . to say that your friend is a 'prince'?" Such words as "regal," "royal" and "imperial" have been applied to models without raising protest, the company argues: "But Dictator—that's a fighting word. Well, the Dictator is a fighting car."

NO. 158—Three times a week the former King of Rumania, now Crown Prince Michael, becomes worker No. 158 in the Ford plant at Bucharest. It's all a part of the modern education of the 15-year-old heir to the throne. When

it came time for the young prince and his classmates to choose a trade they voted to become automobile mechanics. Ford directors agreed to accept the boys on condition that they receive the same treatment as other workers. The prince, being naturally democratic, accepted willingly and as a frame riveter now takes orders from a foreman during his time in the plant. Like other apprentices, his pay is equal to about 20 cents an hour.

SITDOWN FOR SAFETY—Urging the women of America to inaugurate sitdown strikes against riding with drinking drivers, as a major contribution to the cause of highway safety, Norman Damon, manager of the safety department of the Automobile Manufacturers Association, addressed the luncheon conference of the Women's National Exposition of Arts and Industries in New York. "By remaining seated at home or in restaurants rather than venturing out to ride with any driver who had been drinking," said Mr. Damon, "women can establish a new and highly desirable aspect of motor manners that would have a direct effect upon the individual and at the same time place a social stigma upon the practice of riding with drivers who have been drinking."

STRIKE BILL—Insurance claims totaling about \$700,000 for sitdown strike damages in automobile plants have been filed with Hartford Insurance companies, it is reported. Approximate amounts are as follows: Reo, \$100,000; GM (Flint), \$250,000; Hudson, \$150,000; Chrysler \$200,000. Claims were filed under the riot and civil commotion clauses of the policies.



This novel tree-cutting machine was invented by Kirk Knight, of Bartlett, Texas. Propelled by a tractor, the scissor-like blades bite through tree-trunks when pressure from the advancing tractor forces the jaws together. A clean, smooth stump is left 6 in. above the ground. The largest tree cut off by the machine was an elm 22 in. in diameter. The inventor claims his tree-mower can cut two trees a minute and estimates it will do the work of 200 woodcutters.

—Time photo

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES

Further declines in prices of Government bonds were accompanied by recessions in some branches of business activity last week. Conditions in security and commodity markets in general were unsettled, with pronounced declines in some cases. Nevertheless, activity in both retail and wholesale trade continues to show substantial gains above the levels of a year ago.

Carloadings Off Slightly

Among the branches of business in which decreases have been reported is the movement of railway freight. Loadings during the week ended April 3 totaled 726,687 cars, showing a decrease of 34,422 cars, or 4.5 per cent, from the figure for the preceding week, but a gain of 113,106 cars, or 18.4 per cent, above that for the corresponding period last year.

Food Costs Advance

The retail cost of food rose 1.1 per cent between Feb. 16 and March 16, according to the Bureau of Labor Statistics. The major part of the increase is attributed to the continued advance in prices of fresh fruits and vegetables, together with a rise in the cost of meats. Of 51 cities covered by the report, 46 showed increases.

Lumber Output Rising

The lumber industry during the week ended March 27 stood at 68 per cent of the 1929 weekly average of production and at 74 per cent of 1929 shipments. New orders were the highest for the year to date, while production was about equal to that in the preceding week, which was also the highest for the year thus far.

Electric Production Up 15%

Production of electricity by the electric light and power industry of the United States for the week ended April 3 was 15 per cent greater than in the corresponding period last year. For the preceding week, a rise of 18.1 per cent above last year's figure was reported.

Crude Production Steady

Average daily crude oil production for the week ended April 3 was 3,422,350 bbl., showing a decline of 8950 bbl. from the output for the preceding week, but remaining above the 3,243,000 bbl. calculated by the Department of the Interior as the total of the restrictions imposed by the various oil-producing states for April. Average daily output for the four weeks ended April 3, 1937, was 3,418,650 bbl., while that a year ago was 2,873,900 bbl.

Fisher's Index

Professor Irving Fisher's index of wholesale commodity prices for last week stands at 94.5, as against 94.7 a week before, 94.4 two weeks before, 93.7 three weeks before, and 92.9 four weeks before. The figure reported a week ago was the highest for the year to date.

Federal Reserve Statement

The Federal Reserve banks' holdings of Government securities increased \$29,000,000 during the week ended April 7, showing the first substantial change in several years. As a result of this increase, together with a decline of \$36,000,000 in Treasury deposits with the Federal Reserve banks, member bank reserves rose \$45,000,000. An offsetting factor was the increase of \$10,000,000 in money in circulation.

The Sogo Internal Combustion Engine Works, upon recapitalization to 2,000,000 yen, will take up production of automobile engines using acetylene as fuel. The Sogo acetylene engine is based on a patented acetylene gas generator and carburetor, both of which are enclosed in the cylinder block. It is claimed that any type of internal combustion engine may be adapted to the acetylene system at small cost.

Strike Settlement Reflected In Labor Statistics for Feb.

Of the 16 industries for which labor turn-over rates are surveyed monthly by the Bureau of Labor Statistics, the highest accession rate (10.23) was shown in automobile and body manufacturing plants last February. The sharp increase over January, which had a rate of 3.63, was due principally to the settlement of the General Motors strike.

The highest quit rate (4.29) for the month occurred in the automobile parts and equipment industry.

Detailed labor turn-over figures for the automobile and body and the automobile parts industries follow:

Table 2—Monthly Turn-Over Rates (per 100 Employees)

Class of rates	Feb., 1937	Jan., 1937	Feb., 1936
Automobiles and Bodies			
Quit	1.44	1.40	0.70
Discharge	0.19	0.30	0.15
Lay-off	1.54	5.20	3.29
Total separation ..	3.17	6.90	4.14
Accession	10.23	3.63	3.77
Automobile Parts			
Quit	4.29	1.91	0.88
Discharge	0.46	0.53	0.34
Lay-off	2.95	5.25	5.46
Total separation ..	7.70	7.69	6.68
Accession	6.69	5.90	2.90

Notes from Nippon

Jap Firm Makes Stainless Steel Bodies; New Diesels Offered

Following the modern trend, the Naigai Kinzoku Kabushiki Kaisha, Tokyo, has taken up the manufacture of bus bodies of stainless steel. The company intends to manufacture such bodies on a large scale, in close cooperation with the Nippon Stainless Steel Co. Special rolling facilities for this purpose were installed in the Nippon Stainless' Naoetsu plant in Niigata prefecture.

The Aeronautic Institute of Japan, which some time ago began the manufacture of a long distance flying machine of strictly and exclusive domestic make, has completed a trial machine. The machine will shortly be taken to the Kagamigahara army aerodrome, where tests will be made. Some of the features of the power plant are valves provided with a novel cooling equipment and specially designed air tubing. A new high octane fuel, developed by the Institute, will be used.

The Hatsudoki (Motor) Manufacturing Co. has started work on a new 4,000,000-yen plant for the manufacture of Diesel engines and midget cars.

The Toyota Motor-Car division and the Kobe Steel Works have announced new Diesels. This is another addition to the four makes of vehicle Diesels which are already being marketed in Japan and Continental Asia.

Their principal specifications follow:

	Toyota Toyota "A"	Kobe Steel Works 4-ZA-9" "6-ZA-9"	
Number of cylinders	6	4	6
Bore in mm.	84.14	90	90
Stroke in mm. ..	101.60	140	140
Piston displ. in cu. cm.	3389.5	3500	5300
Max. speed, r.p.m.	2900	2200	2200
Max. output, b.h.p.	65	50	75

The Nihon Sangyo Co. (Nissan for short) which is the holding company for the Nissan Jidosha and Hitachi companies, has increased its authorized capital by 25,000,000 yen, to 225,000,000 yen. The paid-up capital also advanced from 124,561,250 yen to 152,790,000 yen.

40 Years Ago

with the ancestors of
AUTOMOTIVE INDUSTRIES

Foreign Notes

It is proposed to construct an "automobilrome" at Boulogne, near Paris. Translated from the French, this word means a race course or driving park, where may be had every facility for the speeding of motor vehicles. Cyclists will be allowed on the track afternoons only.

A procession of motor carriages was organized recently in Paris from the Tuileries Gardens to the Bois de Boulogne. Unfortunately the conditions were unfavorable for a demonstration of this kind, which depended for success upon fine weather, and for hours previously the rain had fallen in a heavy downpour. Profiting by a temporary clearing up, about 30 vehicles gathered at the starting place, a great many of the competitors abstaining owing to the threatening weather.

The annual motor cycle race under the auspices of Velo, the Paris newspaper, took place April 4. The distance was about 63 mi. The weather was so bad that out of 85 entries only 14 started, all mounting De Dion & Bouton tricycles. Of the 14 starters 10 were able to finish, the time of the winner being 3 hr. 9 min. 5 4/5 sec.

—From *The Horseless Age*, April, 1897.

April 17, 1937

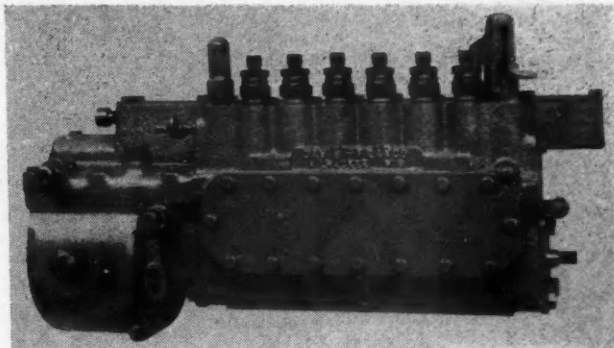
Automotive Industries

Injection Timing Variable In Davis-Franco Fuel Pump

Mention was made in *AUTOMOTIVE INDUSTRIES*, April 10, of the fact that the Davis & Thompson Co., Milwaukee, Wis., had undertaken the manufacture of a fuel injection pump developed by F. M. Davis and J. S. Franco. Full technical details of the pump are not available at this time, but some particulars have been furnished regarding its operating characteristics.

One feature of the pump is that under "full throttle," injection starts slightly earlier and ends later than under "light throttle." It is claimed that with this timing it is not necessary to use so high a compression as with a system in which the start of injection is independent of the amount of injection, and that the engine idles more smoothly. Injection of the full charge extends over 13 degs. of crank motion, and the

The Davis-Franco
Diesel fuel in-
jector pump.



pump can be timed so that injection begins at 10 deg. ahead of dead center and ends 3 deg. after dead center. With such a timing a compression ratio of 14 to 1 is said to give good results. It is further claimed that with this injection system the distribution of fuel to the various cylinders is uniform even

though the high-pressure lines vary considerably in length. Surplus fuel is returned from the pump cylinder to the supply line through the intake port at low pressure. The plungers of the pump have no grooves in them, and the manufacturers say it is possible to make adjustments to take care of considerable leakage.

The pump is made in two main assemblies, the head assembly and the base assembly. The former contains the pump sleeves, plungers and throttle parts; the latter, the camshaft, governor and feed-line connection. Any service operations on the head assembly (and even its complete exchange) can be effected without removing the base assembly and disturbing the timing. This eliminates the necessity of retiming the pump. Each individual pump element can be rendered inoperative without stopping the engine.

One of the most difficult problems encountered in the development of the pump was to make the fuel-control mechanism so sensitive that it would respond readily to the governor. This was finally solved in a very satisfactory manner; the company supplies its own make of governor, and this is said to hold the engine speed within five per cent between full load and idling.

Automotive Metal Markets

Steel Production Passes 90% of Capacity; No Advance in Prices Expected During Third Quarter

By William Crawford Hirsch

In response to a large number of releases from automotive plants that are striving to get back into normal production following strike shut-downs, steel production was stepped up further this week. The American Iron and Steel Institute reported 90.3 per cent of ingot capacity in operation as against 89.9 per cent last week. Some finishing mills have revamped their production schedules with a view to accommodating those of their old automotive customers who are pressing hard for deliveries of steel intended for current assemblies, subordinating routine orders from jobbers and others who appear to be bent upon building up reserve stocks.

It is generally expected that third quarter prices will be announced within a fortnight or so, the majority guess being that there will be no advances. Some of the smaller "independents" are said to favor passing a larger slice of the increased cost of their products on to the consumer, but moderation is being counseled by the most influential market factors. The much talked of practice of transactions for future delivery on the basis of the steel being priced at the market at the time of shipment is coming in for more and more criticism from both producers and consumers. A good deal of this sort of business has been booked in recent weeks, especially in sheets. Without a more definite price consideration in such bookings, many question whether these transactions would be binding in the event of a sudden change in market conditions. Some buyers, however, see a certain amount of assurance that their wants will be taken care of in a time of possibly tight supply through having mills accept their orders at an open price.

With few exceptions, mills are booked for nearly all of their second quarter production, but somehow or other there always appears to be a chance under such sold-out conditions to slip in orders for a little extra tonnage here and there, provided specifications are attractive.

Some of the steel mills, in an effort to bring down the price of scrap, are now turning down offers from dealers and brokers and buying direct from the railroads and other scrap sources. Everything possible is being done to speed up the movement of iron ore, ice breakers being used to get Lake naviga-

(Turn to page 605, please)

U. S. New Car Registrations and Estimated Dollar Volume by Retail Price Classes*

	New Registrations				Estimated Dollar Volume			
	February		First Two Months		February	Per Cent of Total	First Two Months	Per Cent of Total
	Units	Per Cent of Total	Units	Per Cent of Total				
Chevrolet, Ford and Plymouth	131,041	61.00	297,749	60.13	\$80,600,000	53.98	\$206,200,000	52.86
Others under \$750	3,339	1.65	5,912	1.19	1,900,000	1.13	3,400,000	.67
\$750-\$1,000	68,798	32.02	163,536	33.02	80,400,000	35.40	142,000,000	36.40
\$1,001-\$1,500	9,976	4.64	23,748	4.80	11,900,000	7.09	28,500,000	7.31
\$1,501-\$2,000	766	.36	1,990	.40	1,300,000	.78	3,400,000	.87
\$2,001-\$3,000	707	.33	1,761	.36	1,900,000	1.13	4,700,000	1.20
\$3,001 and over	207	.10	488	.10	800,000	.46	1,900,000	.49
Total	214,834	100.00	495,184	100.00	\$167,600,000	100.00	\$390,100,000	100.00
Miscellaneous	139		404					
	214,973		495,588					

* All calculations are based on delivered price at factory of the five-passenger, four-door sedan, in conjunction with actual new car registrations of each model. The total dollar volumes are then consolidated by price classes. No comparative data with a year ago are available due to the change in the listing of the prices from the old F.O.B. which did not include certain standard equipment, to the new delivered prices which include standard equipment, federal taxes but no transportation charges.

Strike Losses Counted

(Continued from page 575)

quarter's output to indicate what might have been the results of that period were it not for the strikes. Approximately 48,000 units of the strike loss fell in the current quarter. Also GM in March ran about 35,000 units higher than its previous month's schedule which probably represented its effort to make up for the strike loss.

It seems, conservative, however, to assume that the first quarter dropped upwards of 325,000 units from its potential output on account of strikes.

In other words, it might have shown a total of 1,623,000 units instead of 1,298,000 as now indicated. How much of this loss can be made up in the second quarter is a question. It was scheduled for near-capacity operations anyhow under normal conditions. Practical capacity of the industry is between 27,000 and 28,000 units daily, which if maintained for the 65 working days in the period would yield a second quarter output in the neighborhood of 1,800,000 units as against 1,477,652 in the corresponding period last year.

Packard production in March reached the new high figure for the company of 14,827. This compares with 6869 for March, 1936, an increase of 116 per cent. The previous highest month was last February, with 12,780 cars. Production for the first three months of this year was 38,315 compared with 16,579 for the first quarter of 1936. Present rate of production has risen to 680 units per day.

A gain of 52 per cent in Graham domestic retail deliveries for March as compared with February is reported. During March 1400 new cars were delivered to owners compared with 923 deliveries in February. The March figure also shows an increase of 38 per cent over January when 1017 cars were delivered. The company's total sales during the first six months of the present model year show a gain of 35.6 per cent over the similar period a year ago.

APEM Employment 24.8% Higher Last January

A survey recently completed by Automotive Parts & Equipment Manufacturers Association of 274 identical companies for the four-week period ending in January, 1937, against January, 1936, shows that 24.8 per cent more

workers were employed by this industry this year than last. These 274 companies, located in 21 states, represent every type of automotive part and accessory manufactured. Total factory employment for these companies during January was 148,238 as compared with 118,766 in January, 1936.

The total payroll for January was \$15,058,000, an increase of 30.3 per cent over the same month of 1936. The average hourly rate of pay for all male and female factory employees, regardless of the type of work performed, was 68 cents an hour, an increase of 8.1 per cent over last year and an increase of 24.1 per cent over January, 1934.

Due to the General Motors strike, the average hours per week worked by each productive employee dropped during January of this year to 35.1 hours as against 36.2 hours last year but, even with the drop in the average hours worked, each employee earned an average of 4.9 per cent more per week than he did last January and 32.3 per cent more than he did during January of 1934.

MESA Head Calls Off Michigan Tool Strike

A sitdown strike of a few hours' duration was called off in the plant of the Michigan Tool Co. when Mathew Smith, head of the Mechanics Educational Society of America, told the men to go back to work.

The sitdown strike started as the result of a brawl between several newly hired men and shop stewards of the MESA which, under a contract signed in January, has exclusive bargaining rights to represent labor at the Michigan Tool Co. The strike was called pending the arrival of Smith at the plant.

Possibilities that the men starting the fight were either foreign agitators, labor racketeers, or rival labor union men trying to break up the harmonious relations between the MESA and the company are being investigated by company officials.

"Under our contract with the MESA, we recognize that organization as the exclusive bargaining agency," Otto Lundell, president of the Michigan Tool Co., stated today. "We expect that the friendly relations existing between our shop management, our employees, and the MESA will continue."

The Michigan Tool Co. is one of the leading manufacturers of gear production and checking equipment and also an important builder of metal cutting tools and hobs. The Ford Motor Co. is a major customer.

Harnischfeger Corp. to Produce Welding Rods

Harnischfeger Corp., Milwaukee, a large manufacturer of arc-welding equipment, has established a weld rod department with J. P. Morrissey, pioneer welding engineer, in charge. It is reopening its old Hercules steel foundry and equipping it for production of weld rods on a large scale. Formulas for various types of rods have been in development for more than two years under the direction of J. C. Joublane.

Four Wheel Auto Drive Buys \$100,000 More Equipment

Purchase of \$100,000 worth of new production equipment by the Four Wheel Drive Auto Co. of Clintonville, Wis., and Kitchener, Ont., Canada, is being undertaken because of the increase in the company's sales volume,

Retail Car Financing Off in February

Slight Decrease from January but 13.5% Gain Over February, 1936; Wholesale Credits Lower

The dollar volume of automobile retail financing for February, 1937, amounted to \$104,064,196, a decrease of 3.2 per cent compared with January, 1937, according to statistics released by the Bureau of the Census, and based on data reported by 456 identical organizations. February retail financing was, however, a gain of

13.5 per cent when compared with the same month last year.

The \$127,388,466 shown for wholesale financing for February, 1937, is a decrease of 19.8 per cent from the previous month and a gain of 8.8 per cent compared with February, 1936.

Comparative statistics for the different forms of financing follow:

Year and Month	Wholesale Financing Volume in Dollars	RETAIL FINANCING											
		TOTAL			NEW CARS			USED CARS			UNCLASSIFIED		
		Number of Cars	Total Amount	Per Car	Number of Cars	Total Amount	Per Car	Number of Cars	Total Amount	Per Car	Number of Cars	Total Amount	Per Car
February, 1937	\$127,388,466	1264,707	\$104,064,196	\$393	98,313	\$57,612,034	\$586	165,038	\$45,963,750	\$279	1,366	\$466,412	\$360
January, 1937	158,936,328	*264,751	107,537,399	406	109,568	63,665,282	581	153,721	43,333,014	282	*1,462	539,123	*389
February, 1936	117,133,986	232,106	91,671,545	395	98,953	57,038,172	576	131,666	34,128,106	259	1,467	506,267	340
Total, 2 mo. 1937	\$286,324,792	529,458	211,601,595	400	207,881	121,277,296	583	318,759	89,296,764	280	2,818	1,027,535	365
Total, 2 mo. 1936	240,329,874	474,550	184,986,756	390	202,123	115,237,856	570	269,446	66,746,070	255	2,961	1,002,630	336



Sovfoto

Latest of the many garages built in Moscow in recent years is the one shown above where official cars of the People Commissariat of Heavy Industry are cared for. Whenever an engine is run inside the garage a hose (right) connects the exhaust with a ventilator so that workers are not exposed to carbon monoxide fumes. The garage has a number of rest rooms for the personnel, a reading room and a billiard room.

according to Walter A. Olen, president and general manager.

Issuance of \$100,000 in rights to stockholders to purchase a new issue of common stock has provided the company with new working capital. Expenditure of the \$100,000 will provide the company with a new heat-treating department which is now being installed; new lathes; gear-cutting machinery; and other production equipment.

Toledo Plants Resume Work On Chrysler Parts Orders

Parts plants in Toledo are resuming production this week following resumption of operations in Chrysler plants in Detroit.

Electric Auto-Lite Co., which laid off almost its entire force, has recalled more than 1000 workers this week and will soon bring production up to normal.

City Auto Stamping Co., which closed its stamping plant within an hour after the Chrysler strike began in Detroit, has recalled 600 workmen and is expecting to have the complete force of 1300 back on the job by the end of the week. Logan Gear Co. is putting its 500 workers back on the payrolls at once.

UAW Splits Ontario

(Continued from page 575)

against "John L. Lewis and the forces of Communism." Concentrated in Toronto for possible strike duty were 100 Royal Canadian mounted police and 200 war veterans sworn in as special constables.

In their letters of resignation, the two dissenting ministers, David A. Croll, Minister of Labor, and Arthur W. Roebuck, Attorney General, protested the "unnecessary" display of

force and asserted that Canadian workers had the right to join a union "of their choice."

Another Canadian public official, Mayor Alex C. Hall, of Oshawa, came to the side of the strikers and threatened to stand in their front ranks if troops were sent to his city. Hall also telegraphed Homer Martin, president of the UAW, urging his union to strike in the United States plants of General Motors if the Canadian dispute was not settled before the end of the week.

The General Motors strike was called when the Canadian subsidiary of the corporation refused to recognize the union as bargaining agent for its employees.

Motor Wheel-UAW Parleys Near Favorable Conclusion

Peaceful negotiations are now under way between the United Automobile Workers of America and the Motor Wheel Corp. at Lansing. Three conferences have been held between the union bargaining committee and the management, and the workers have held one meeting in which they have gone over a proposed agreement.

It is understood that the management has agreed to recognize the union as agent for its members and to adopt the bargaining clause incorporated in the Chrysler, Reo and Hudson settlements.

Springfield Honors Charles Duryea

*Birthplace of America's First Gasoline Automobile
Holds Celebration for Inventor*

Charles E. Duryea, of Philadelphia, builder of the first gasoline automobile in the U. S., was honored by the city of Springfield, Mass., home of the first car, on April 14. The celebration was sponsored by the Kiwanis Club.

A parade, organized under the auspices of the Springfield Dealers Association, opened the program. One of the features of the procession was a Stevens-Duryea car built in 1911 which has been registered and operated every year since then. The parade ended at a hotel where a banquet was held, the program being broadcast. H. Louis Elmer, of Hartford, Conn., believed to be the first automobile dealer in New England, was the principal speaker. Mr. Duryea described at length the early history of the automotive industry and his own experiences in building his first cars. He also called on Julian Chase, directing editor of AUTOMOTIVE INDUSTRIES, to tell about the Duryea car which his father bought and which Mr. Chase rebuilt.

At the conclusion of the banquet, Mayor William P. Yoerg, of Holyoke, Mass. (for 29 years a U. S. Tire dealer), presented Mr. Duryea with a plaque given by the U. S. Rubber Co., successor of the maker of the tires used on Mr. Duryea's first machine. Following the dinner, a tablet was unveiled by Mr. Duryea's eight-year-old granddaughter at 47 Taylor Street where the first gasoline "buggy" had its initial pulling test.

Other prominent members of the automotive industry who attended the Springfield celebration were: Alfred Reeves, vice-president and general manager of the Automobile Manufacturers Association, who represented the association; David Beecroft, representing the Bendix Aviation Corp., and George W. Sutton, president of the American Power Boat Association. Unable to attend the ceremony, Edsel Ford, Walter P. Chrysler and Alfred P. Sloan, Jr., forwarded appropriate messages.

Letters

to AUTOMOTIVE INDUSTRIES

Passing Distances

E. R. Morton refers to the increasing accident rate with the newer cars, and cites poor visibility, soft springs combined with inadequate shock absorbers together with poor weight distribution among the contributing causes.

Perhaps if enough voices are raised in protest against cars designed by sales engineers, the design engineers may be able to secure the adoption of sound designs.

Mr. Morton's comment on soft springs reminds me that headlight glare which is such a menace to night driving is materially affected by soft spring suspensions, particularly when the rear seat is mounted over

or behind the rear axle. In some cases the suspension is such that a decided front end uptilt results when the rear seat is loaded. The normally pointed headlights then direct their full intensity of rays into the eyes of oncoming drivers.

A serious factor in the increasing accident rate is the passing of a car going, say 40 m.p.h., by another car whose driver has no conception of the distance required to accomplish the passing. Here as in braking much mis-information has emanated from the manufacturers' sales research, so that we often hear from the lips of apparently sane persons that they can stop on a dime from 30 m.p.h. A pamphlet by GM entitled "We Drivers" in this year of 1937 informs us that: "When we try to pass a car that's going, for instance 40 m.p.h., it's just the same as if we tried to pass a standing string of cars 300 ft. long or more, depending on our own speed in passing. In other words, it's like passing at least eighteen cars parked bumper-to-bumper in the road."

Now Messrs. Stoeckel, May and Kirby in their book entitled, "Sense and Safety on

the Road" seem to have a better conception of relative speeds than is evidenced in the GM pamphlet, "We Drivers," for they state that to safely accomplish the passing of car A going 40 m.p.h. by car B going 48 m.p.h. the driver of car B must have a view of a clear road for more than 2000 ft.

F. J. CLARKE.

The letter from E. R. Morton referred to above was published in AUTOMOTIVE INDUSTRIES April 3, 1937, page 519.

Missed the Magazine

I had thought that I would get along without AUTOMOTIVE INDUSTRIES this year, but I miss the magazine already so am enclosing check for another year's subscription.

W. C. FAIRCHILD.

Calendar of Coming Events

SHOWS

Yugoslavia, 14th Automobile Salon, Zagreb	April 17-26
Illinois Automotive Ass'n, 4th Annual Show and Maintenance Exhibit, Navy Pier, Chicago	Apr. 24-28
Poland, Automobile Salon—16th International Fair, Poznan	May 1-10
Norway, Automobile Salon—Oslo	May 7-10
Second Annual Automobile Maintenance Show, San Francisco	May 20-23
Morocco, Automobile Section, Tangier Fair, Tangier	June
France, Automobile Section, Bordeaux Fair, Bordeaux	June 13-28
Belgium, First International Aeronautical Salon, Brussels	June 18-30
Fourth ASTM Exhibit of Testing Apparatus and Related Equipment, New York	June 28-July 2
Poland, Automobile Salon (Foire Orientale), Lwow	Sept. 1-15
France, 31st International Automobile Salon, Paris	Oct. 7-17
Great Britain, 31st International Automobile Exposition, London	Oct. 14-23

Show Business

Manager of the National Automobile Show in New York is Alfred Reeves, 366 Madison Ave., N.Y.C. Inquiries concerning all matters connected with the national show should be addressed to him. AUTOMOTIVE INDUSTRIES will be pleased to furnish names and addresses of local show managers on request.

National Automobile Show, New York, Oct. 27-Nov. 3	
Italy, 10th International Automobile Salon, Milan	Oct. 28-Nov. 8
Buffalo, N. Y., Automobile Show, Oct. 30-Nov. 6	
Cincinnati Automobile Show, Oct. 31-Nov. 6	
Great Britain, 13th International Commercial Automobile Exposition (trucks and buses), London	Nov. 4-13
Chicago Automobile Show	Nov. 6-13
Akron Automobile Show	Nov. 6-12
Omaha Automobile Show	Nov. 6-11
Brooklyn Automobile Show	Nov. 6-13
Columbus Automobile Show	Nov. 6-13
Detroit Automobile Show	Nov. 6-13
Kansas City, Mo., Automobile Show, Nov. 6-13	
Motor Truck Show, 4th Annual, Newark, N. J.	Nov. 6-12
Newark, N. J., Automobile Show, Nov. 6-13	
Philadelphia Automobile Show	Nov. 6-13
Pittsburgh, Pa., Automobile Show	Nov. 6-13
Toronto, Ont., Automobile Show	Nov. 6-13
Great Britain, 36th Scottish International Automobile Exposition, Glasgow	Nov. 12-20
Baltimore, Md., Automobile Show, Nov. 13-20	
Cleveland, Ohio, Automobile Show, Nov. 13-20	

Jersey City, N. J., Automobile Show, Nov. 13-20	
Milwaukee, Wis., Automobile Show, Nov. 13-20	
Springfield, Mass., Automobile Show, Nov. 14-20	
St. Louis, Mo., Automobile Show, Nov. 14-21	

CONVENTIONS AND MEETINGS

International Association for Testing Materials, Second International Congress, London, England	April 19-24
S.A.E. National Tractor and Industrial Power Meeting, Peoria, Ill.	April 21-23
U. S. Chamber of Commerce, 25th Annual Meeting, Washington, D. C., April 27-29	
National Machine Tool Builders' Association, Spring Convention, Edgewater Beach Hotel, Chicago	May 3-4
41st Annual Convention and Exposition of the American Foundrymen's Association, Milwaukee	May 3-7
S.A.E. Summer Meeting, White Sulphur Springs, W. Va.	May 4-9
National Battery Manufacturers Assn., Spring Convention, Shoreham Hotel, Washington, D. C.	May 13-14
American Society of Mechanical Engineers, spring convention, Detroit, May 17-21	
National Association of Purchasing Agents, 22nd Annual Convention, William Penn Hotel, Pittsburgh, Pa.	May 24-27
American Petroleum Institute, Mid-Year Meeting, Colorado Springs, Colo.	June 1-3
Second World Petroleum Congress, Paris, France	late May—early June
Automotive Engine Rebuilders Association, 15th Annual Convention, Chicago	June 21-24
American Society for Testing Materials, 40th Annual Meeting, New York, June 28-July 2	
American Transit Association, 56th Annual Convention, White Sulphur Springs, W. Va.	Sept. 19-23
S.A.E. National Aircraft Production Meeting, Los Angeles, Calif.	Oct. 7-9
S.A.E. Annual Dinner, Commodore Hotel, New York	Oct. 28
American Petroleum Institute, 18th Annual Meeting, Stevens Hotel, Chicago	Nov. 9-12
SAE National Production Meeting, Flint, Mich.	Dec. 8-10

CONTESTS

Indianapolis Speedway, 500-Mile International Sweepstakes	May 31
31st Annual Grand Prix of the Automobile Club of France, Linas-Monthéry	July 4
Pan American Cup Race, Roosevelt Raceway	July 5
National and International Soap Box Derby Finals, Akron, Ohio	Aug. 15
Roosevelt Raceway, 400-Mile George Vanderbilt Cup Sweepstakes	Sept. 6
National Outboard Championship Regattas, Richmond, Va.	Sept. 18-19
Los Angeles, 500-Mile International Sweepstakes	Nov. 28



"The Need for More Machine Tools" is the title of an article by Philip E. Bliss, president of the Warner & Swasey Co., which appears in the March-April issue of "The Cleveland Trust Magazine," published by the Cleveland Trust Co., Cleveland, Ohio.

Every user of machine tools will be interested in "Haynes Stellite J-Metal Cutting Tools," a new 52-page booklet published by the Haynes Stellite Co., containing 60 illustrations of tools and machining operations and giving detailed information on how to obtain maximum results in machining cast iron, malleable iron and most steels.*

A booklet describing "Plastacele," a molding powder offered by the plastics department of E. I. du Pont de Nemours & Co., Inc., gives a description of the powder and its uses, as well as general information on handling it in molding operations.*

An industrial guide for the proper selection of wire and cable has been issued by the Anaconda Wire & Cable Co. This 32-page booklet is intended to serve engineers confronted with ticklish wiring problems. Colored layouts illustrate typical power supply circuits and tables cover practical limitations to be considered.*

Third of the "Sportsmanlike Driving" series of booklets on traffic, safety and driving, published by the American Automobile Association has appeared. The title of this pamphlet is "Sound Driving Practices." Written in clear, simple language this pamphlet contains 108 pages with 63 illustrations. Some of the subjects treated are: right-of-way and traffic laws; city driving; driving on the open highway; and when driving practices are unsound. Available from member clubs of the American Automobile Association.

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

Gudgeon-Wemmer Corp. to Make Hydraulic Brake and Clutch

Gudgeon-Wemmer Mfg. Co., Madison, Wis., has been organized with \$100,000 authorized capital stock to manufacture a hydraulic brake and hydraulic clutch developed by Stephen A. Gudgeon and J. B. Wemmer, both of La Farge, Wis., near Madison. An engineering plant will be established in Madison shortly. Other automotive products are also to be manufactured.

Photo courtesy, E. F. Houghton & Co.

A Perliton pot with a limited carbon excess as used for reheating.

Automotive *Materials*

2

PERLITONIZING, a new carburizing process, uses a salt bath plus an amorphous carbon added to supercharge the bath, keep it in balance, and maintain a slight crust over the top which holds in carburizing gases and prevents excess surface radiation losses. The process is used today in production of gears, other automotive parts, and many small steel pieces. (For additional data on this process see page 596.)

The photograph above introduces the

special section devoted to automotive materials which is a feature of this issue of Automotive Industries, and which will continue to appear in each third issue of the month. Automotive finishes are spotlighted in an article which begins on the following page. Various new developments in the materials field are given news treatment beginning on page 592.

Next month (May 15 issue) the feature article in this section will be concerned with plastics in automotive applications.

STYLE SELLS CARS

By H. E. Blank, Jr.

EXACTING demands of the automobile manufacturers for materials and equipment suited to their changing production requirements have initiated development work in many fields of industrial activity and the suppliers of finishing materials for automotive vehicles were among the

*—and motor vehicle finishes
are a big element in style.
Here is the story of how the
finish manufacturers have
contributed to the progress
of the industry*

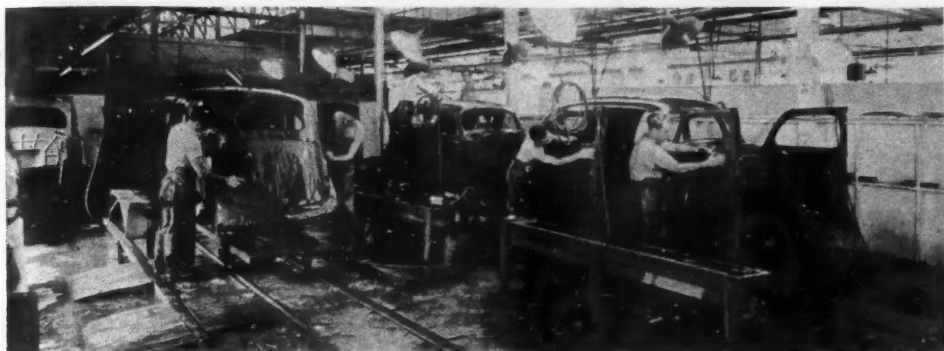


first to experience and respond to the pressure of these demands. Only a short time after the inception of the horseless carriage the makers of vehicle paints were urged to develop and produce faster drying and more durable metal surface coating materials. Research efforts of the paint chemists, concerned primarily with the fundamental properties of speed of application, quick drying, attractive initial appearance, appearance retention and durability in service, have made definite contributions to the evolution of the modern vehicle and are constantly improving finishing materials to comply with contemporary production needs of the automotive industry.

Modern finishes have evolved from changes made in the basic ingredients of the materials used, the discovery of new synthetics, and the development of new equipment and techniques for application of coatings. Also responsible for the excellent results being obtained today are the closely related developments in processes for metal cleaning, rust-proofing, and electro-plating. The record of progress made in finishing automotive vehicles, coupled with hints of new trends, provides substance for interesting speculation on what may be brought forth in this field in the future.

April 17, 1937

Automotive Industries



After Willys automobile bodies are cleaned with acid solution they are given an alkaline bath. All traces of acid are removed and the metal surface is ready to receive the prime and final finish coatings

The first automobiles built were painted with carriage finishes, exactly the same type paints being used at the time to paint buggies and wagons. It was soon discovered that these finishing materials, or oleoresinous varnishes, were absolutely unsatisfactory for automotive application. They were exceptionally slow to dry, easily marred, and not very durable. Especially from the standpoint of production were they undesirable. It was early practice to apply the varnishes by hand brushing and, due to slow drying, more than a month was required in some plants to complete the finishing job. In 1913 the finishing schedule of one automobile manufacturer was six weeks and the painting process included: 11 coats of primers, glaze, roughstuff, and surfacers; 4 to 6 color coats; 2 coats of rubbing varnish; and 1 coat of finishing varnish.

As the automobile became more popular and the demand for the product increased, production naturally had to be stepped up and it was necessary to eliminate the bottle-neck effect of the finishing departments. To hasten drying, more and more gums were added to existing types of finishing materials and a harder, less elastic varnish resulted. A higher production rate was achieved, but the important quality of durability was appreciably lessened and the finishes would last only a few months in service.

Subsequent experiments with more elastic varnish, using heat to speed drying, were not very successful. High baking temperatures could not be used

because the enamel tints were discolored by too much heat. And partial wood construction of the early automobiles also limited the degree of heat that could be safely used in the drying process. Fenders, being all-steel, could be exposed to relatively high temperatures and were finished with high-bake materials. Asphalt japans used for the purpose were more durable than the air-drying varnishes but could be produced only in black.

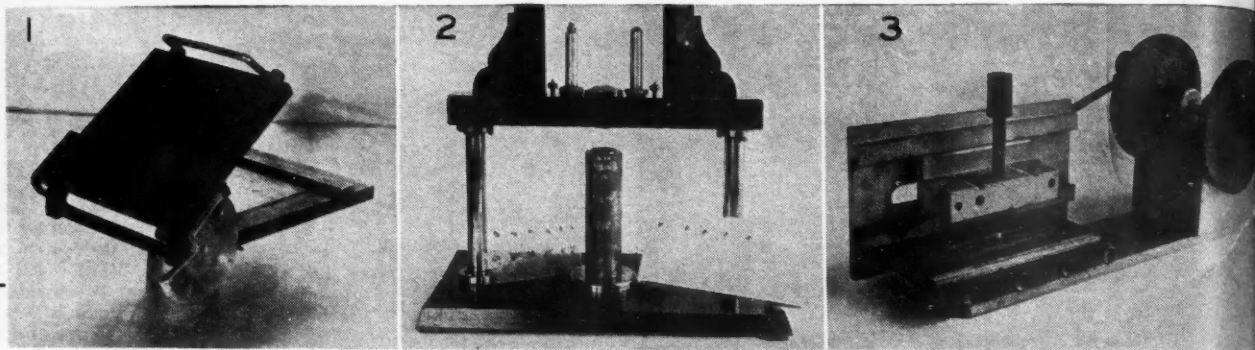
Urgent need of the automobile producers for speed and more speed in the finishing of their product was finally met by the introduction in the early

'20s of quick-drying lacquers based on cellulose nitrate. So substantial was the amount of time saved by the new lacquers that, within a few years, they almost displaced the use of oleoresinous finishes as body coatings.

The new lacquers resulted from successful chemical research both in the preparation of a low-viscosity nitrocellulose and in the wartime development of producing the essential solvent from a new type fermentation of corn. Drying of nitrocellulose lacquer occurs by evaporation of the volatile solvent, a hard film of nitrocellulose remaining on the surface which is coated with



Decorative color bands are applied to bodies and wheels as a final operation in the finishing process. The operator shown here is striping in felloe band circles on Packard wheels with an automatic striping gun



Laboratory Equipment Used for T

1. Protective quality of a finish is largely dependent on the adhesion and flexibility of the film. A device used in making bending tests gages these properties in numerical terms. The actual test simply consists of bending a finished panel of specified gage over a rod of specified size. The machine controls the radius of curvature of the bend in the panel and uniform results can be obtained. Bend tests are made after the finished panels have been aged for various periods and, in all tests, finishes of known performance are compared with the new finish.

2. Flexibility and adhesion properties of finishing materials are also tested by an impact machine which gages these qualities in numerical terms. In the impact machine shown, the finish to be tested is applied to a piece of 20 gage steel which is placed between an anvil and a movable ball bearing. A weight is placed on the cross arm which is dropped on the bearing, causing it to dent the panel.

3. An abrasion machine used for testing metal lacquers and baked enamels. It consists simply of an eraser which contains abrasive material bound together with rubber. The eraser is rubbed over the film and the number of strokes required to rub through the finish is an indication of wear resistance.

4. A color analyzer by means of which any color can be broken down into its spectral components when passed through the proper prism. With the device the relative quantity of the various spectral colors present in a paint can be measured in comparison with the amount of these same colors contained in white, which is taken as a perfect reflector. From these measurements a curve may be drawn which is a definite physical measurement of the color of a finishing material. Principal value of the instrument is in maintaining constant color standard over a period of time, since wet standards of panels will always change color slightly on aging.

the material. The film residue is quite brittle and, to make it suitably plastic, materials such as dibutyl phthalate and tricresyl phosphate are added to the lacquer and remain in the film deposit when the solvent has evaporated. Addition of resin provides the necessary properties of adhesion, body, and luster to the finish. Durability is increased by introducing pigments, such as zinc oxide, which are opaque to ultraviolet light.

Advantages of the nitrocellulose lacquers over the old type finishes were many. They were durable; they would not crack or check when exposed to all weather conditions for several months. And the automotive production men could, for the first time, establish drying schedules in minutes, instead of days and weeks. Their weakness lay, however, in susceptibility to chalking.

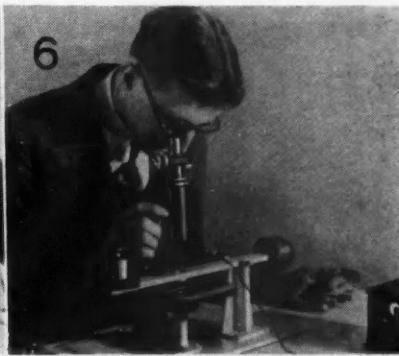
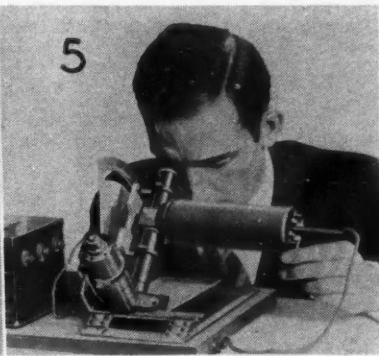
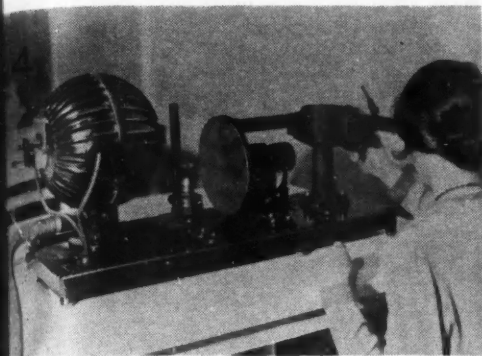
Chalking is the term applied to the formation of pigment dust on the sur-

face of the coating. The pigment is either washed out of the binder or freed by disintegration of the binder. Due to the chalk formation, the lacquer coating quickly lost its gloss and apparently faded in color. To maintain glossy appearance of this type coating it was necessary to frequently rub it with polishing agents. This was undesirable as the finish was finally rubbed through to the undercoat. In production, the lacquers dried with poor luster and additional labor required to produce a satisfactory gloss represented an appreciable financial outlay. Another objectionable factor was the higher initial cost per gallon of lacquer as compared with varnishes. Such undesirable characteristics were easily outweighed by substantial advantages provided by the new finishing material.

Widespread acceptance of the lacquer products stimulated efforts to make varnishes faster drying and of greater durability. New synthetic resins were



Spraying paint on Pontiac engines suspended from an overhead conveyor and continuously passing through the booth. A curtain of falling water behind the conveyor traps the flying paint which is reclaimed



Testing Finishing Materials

5. The Pfund glossimeter measures the gloss of finishes by determining the amount of light reflected by the material. Light from a constant source is reflected from the coated panel into a telescope tube. Half of the eye-piece of the tube is illuminated by the light reflected from the panel, while half of the eye-piece is illuminated by a small light in the photometer tube attached to the side of the telescope. This light is moved back and forth in the photometer tube until the brightness of the two sections of the field match. This distance of the light from the eye-piece is then a measure of the amount of light being reflected from the coated panel and, therefore, is a measure of the film gloss.

6. A practical paint man ordinarily tests the hardness of a finish film by the difficulty he has in driving his thumb-nail into it. The test illustrated accomplishes the same purpose more accurately by measuring the weight necessary to drive the rounded end of a quartz rod a given

distance into the film. The quartz rod is mounted on a counter-balanced lever arm provided with a pan for weights. A film of the material to be tested is prepared on a plate glass disc and the coated disc is placed underneath the microscope table. The rounded end of the quartz rod is allowed to rest upon the film for 60 sec. Examination by microscope of the portion of the quartz rod imbedded in the film reveals a black dot. If the film is hard the impression will be small, if soft the impression will of course be large. Several measurements are made with different weights, a graph drawn, and the weight calculated which would give a predetermined impression. This weight is a measure of the hardness of the material. One or two grams are sufficient to give a standard impression with straight oil-type films, while as much as 2000 gm. are required for some hard lacquer products.

Photos courtesy duPont.

discovered which definitely cut time required for drying and added slightly to the property of durability of varnish finishes. The original synthetics were phenol-formaldehyde combinations dispersed in rosin or esterified rosin. Subsequent developments brought the "straight" phenol-formaldehyde resin, an oil-soluble resin not modified by rosin or other substances. Time required for drying was further reduced and the durability factor considerably increased.

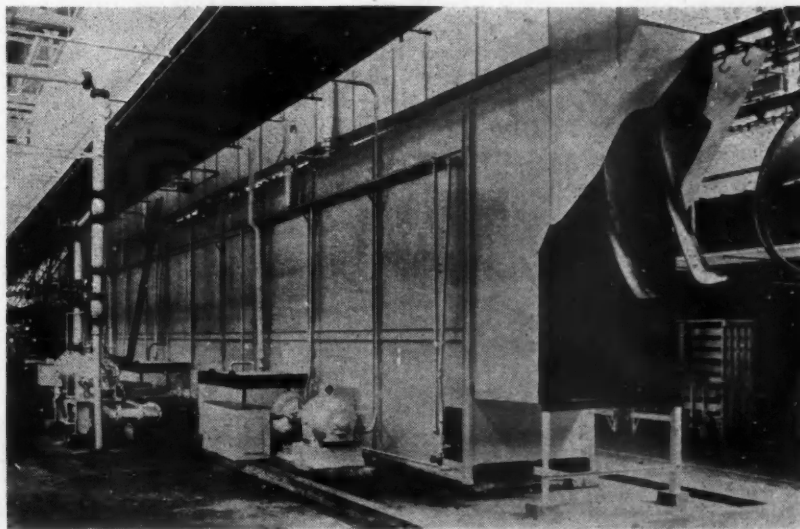
Other synthetic resins, known as alkyds, have appeared on the scene within the past few years. The alkyds are based on combinations of phthalic anhydride and glycerine modified with resins or fatty acids. In addition to making possible much improved varnishes, they increased the durability of nitrocellulose lacquers. Natural resins were swept out of the picture by the new low-bake synthetics. The latter have made possible present-day speedy production schedules and have produced

high gloss finishes which need no polishing. And, they are durable. Modern vehicle finishes are based on the alkyd and phenol-formaldehyde resins.

It has been pointed out by some paint authorities that other new types of resins may achieve greater importance. Before their use in production finishing is feasible, however, several basic difficulties, including high cost and lack of easy application, must be overcome. Among these new types of resins are

the vinyls, the petroleum-base hydrocarbon resins, and the rubber derivatives. Recently, resins of the urea formaldehyde type have been modified in form so that they now can be used in finishes. These resins seem to have possibilities in making baking enamels for automotive application with further improved properties of color retention, hardness, and quick drying.

With regard to undercoat materials there are, theoretically, three types:

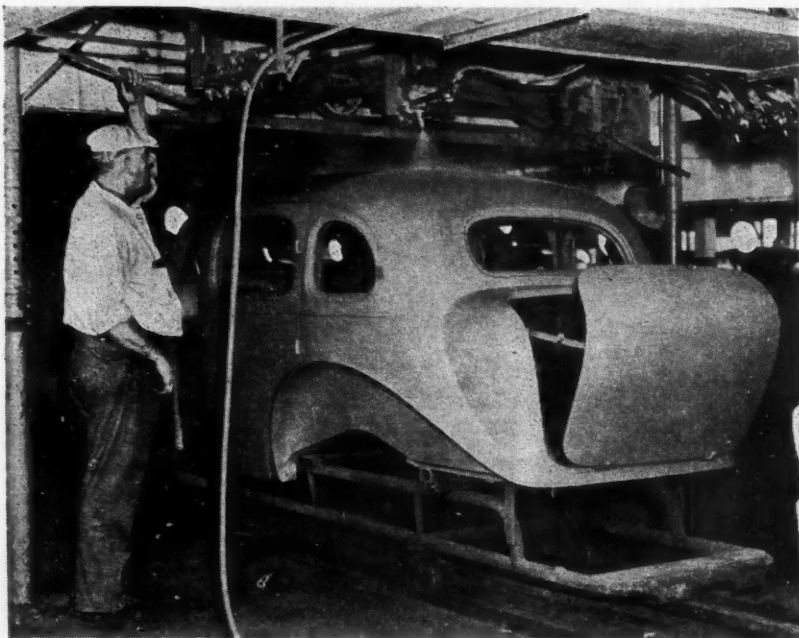


A large installation for rust-proofing automobile fenders. With this type equipment the metal is treated with a chemical comprised of chromic acid compounded with an activating agent

Courtesy American Chemical Paint Co.

Automotive Industries

April 17, 1937



Spraying installation for application of finish to the one-piece seamless steel roofs of Fisher bodies as they move on the production line. The operator changes spray guns when a different color is required, inspects the work, and makes any necessary adjustments

the oil-base or orthodox, the synthetic, and the pyroxylin. Pyroxylin undercoats are considered obsolete in modern production processes because a rather elaborate and costly procedure for satisfactorily cleaning the metal surfaces must be used. Synthetics are faster baking finishes than the orthodox type but have a somewhat higher initial cost.

During the depression, when plant space was not at a premium, there was a general trend back to use of the orthodox type of undercoat material. The movement was accelerated by substantial improvements which were continuously being made in orthodox materials. Among these was the decreased time of baking required, though there was an accompanying increase in baking temperature. Oil-type undercoats are characterized by a high degree of adhesive properties. In present production the automobile manufacturers are about equally divided between the use of synthetic and oil-base undercoats. Generally, the trend of change in undercoats is to higher and higher solids content; in other words, production of an undercoat which will fill and still have properties of good adhesion. According to one finishes expert, "improvements in undercoats have just about reached the ultimate stage of refinement."

Paint suppliers make very careful

and rigid tests of finishing materials, tests which investigate the following principal properties: color, drying rate, hardness, gloss, adhesion, viscosity, weight per gallon, and covering quality. Consideration is given to that property referred to by the paint chemists as color drift or color stability. Color finishing materials tend to change color as they stand in containers and must be carefully watched and controlled. For color control and matching special daylight lamps are used. Undercoats are tested for sanding and lifting qualities, and the property of adhesion. They are also subjected to water and salt water sprays for rust protection qualities. Effect of atmospheric conditions on finishes is tested by exposing coated panels for

about one or two years to all weather influences. One paint manufacturer has 50,000 such panels set out on exposure farms in various sections of the country.

Improvements in spraying equipment have naturally accompanied progressive developments in finishing materials. Present designs are made to give smoother films with finishes having relatively higher solids. In some plants the spraying rooms are constructed to exclude lint, dirt, or other foreign matter. Air in chambers of this type is under pressure so that, when chamber doors are opened, air from the outside containing dust and grit cannot enter to ruin the finish.

It seems that most of the high grade finishing materials marketed today have approximately the same chemical base. Variations are found primarily in production techniques, to the extent that each of the large paint producers has some special feature to offer due to a proprietary manufacturing process. One of the most important elements in the formulation of finishes is the fact that paint makers modify their standard specifications to conform with the production equipment available in automotive plants. Naturally, the characteristics of a finish supplied to one automobile producer may be entirely different in some respects from those of materials supplied to another. Available oven equipment

Modern installation for finishing bodies in large Detroit plant. Paint is conveyed in a totally closed pipe line system from the storage tanks located in a fire-proof mixing room



(Courtesy Binks Mfg. Co.)

April 17, 1937

Automotive Industries



Painting booths in many automotive plants are air-conditioned so that operators who apply finish to the metal bodies may work in an atmosphere virtually free of fumes. The DeSoto installation illustrated receives a continuous supply of filtered air. Suction fans draw exhaust air through a water mist and over baffle plates, cleaning it of pigment before it is passed outside the plant

is a definite factor, for oven temperature controls the formulation of a finishing material. It is interesting to note that when synthetic finishes were first used it was necessary to bake them at temperatures ranging between 225 and 260 deg. F. Improvements have made possible the use today of baking temperatures from 180 deg. F. maximum down to 160 deg. F.

Apparently there are no really significant new trends. Generally, the industry is pointing towards heavier paint films to provide even greater durability of coating; this applies also to the lower priced jobs. Finishing materials, during the past year or two, have been made with upwards of 50 per cent solids content, to facilitate production of a heavier sprayed film with single coats. This trend has materially reduced the amount of thinner used.

Black is the color most used today, while metallic finishes have rapidly won popular favor. During the past season one of the most widely accepted paint materials was the polychromatic lacquer which is formulated with metallic powders. It is estimated by informed persons that this type of material has perhaps another season before its popularity wanes. This finish has the unique property of inhibiting formation of dirt film.

Additional improvements made in finishing materials include increased resistance to chalking and higher resistance to bronzing. With regard to colors: maroons had been a weak sister in the color family for a long time and

today a wide variety of durable maroons are available. Much progress has also been made in producing better blacks. To the uneducated eye, black is black. Modern blacks placed side by side with previous products will make the early blacks appear quite gray. Other advances include lowering of the cost of lacquer, mainly achieved by reducing the amount of thinner required. In general the trends may be summarized as pointing for further improving finishing materials with regard to initial appearance, appearance retention, and lowering cost. Basic finishing materials are just about the same this season as they have been

for the past two. And, apparently, the same materials will be used without change in 1938 production.

The production of high quality vehicle finishes involves more than the inherent properties of the coating materials and the manner in which they are applied. As previously mentioned, developments in rust proofing and cleaning of metal surfaces have contributed much to the achievement of modern automobile finishes. Protection of metal against invasion of rust is not sufficiently provided by paint. Paint is somewhat porous and damaging moisture will seep through to contact the metal surface. Corrosion must, of course, be prevented. If rusting of the metal occurs, the surface coating will peel off and the utility and decorative value of the finish will suffer.

As corrosion proceeds more rapidly on chemically unclean metal surfaces, it is of prime importance that metal surfaces be satisfactorily cleaned before finishing material is applied. Cleaning materials had to be developed to remove active rusts such as traces of pickling acids, soldering flux, body acids from human perspiration, and alkalis deposited by evaporation of rinse waters. A material used in modern cleaning operations is a phosphoric-

Finishes on 1937 Passenger Cars*

Make of Car	Manufacturer of Finishing Material
Buick	E. I. duPont de Nemours & Co.
Cadillac	Rinshed-Mason Co.
Chrysler	Ditzler Color Co.
Cord	Murphy Varnish Co.
DeSoto	Ditzler Color Co.
Dodge	Ditzler Color Co.
LaSalle	E. I. duPont de Nemours & Co.
Oldsmobile	Rinshed-Mason Co.
Packard	Jones & Dabney Co.
	Sherwin-Williams Co.
	Ditzler Color Co.
	E. I. duPont de Nemours & Co.
	Valentine & Co.
Plymouth	Ditzler Color Co.
Pontiac	E. I. duPont de Nemours & Co.
Willys	E. I. duPont de Nemours & Co.

*These data obtained from 1937 body specifications collected by the Automobile Manufacturers' Association.

acid and oil-solvent mixture. Metal surfaces treated with this material are cleaned of rust activators and also receive a thin deposit of phosphates which tends to somewhat further increase the service life of the finishing material. It is successfully used to clean automobile bodies.

For parts such as fenders which are subjected to more rough treatment in service, another process was developed which consists of treating metal surfaces with activated phosphates. The object to be treated is dipped and the resulting deposit inhibits the formation of rust and also provides a strong bond with enamel primer. Due to the fact that the metal surface is etched in this procedure, the mean thickness of the coating of finishing material is greater than it would be if applied to a smooth surface. Thicker paint films are made possible by this type of pretreatment

and, in addition, should the finish coating be broken away, the spread of rust beyond the portion of metal exposed is definitely inhibited. A more recent development of the process utilizes a solution containing zinc phosphate which is sprayed on the metal part being treated. After being sprayed with the solution the object is subjected to a water rinse, followed by a rinse of hot water containing chromic acid. Definite savings in time and expense have been effected with this process.

There is another type of phosphate coating, a fairly recent development. Again, in this procedure, the metal surface must first be cleaned. The cleaned object is immersed in the heated electrolyte—zinc phosphate. Alternating current is used and the metal is coated with a film of zinc phosphate. Inasmuch as the dielectric resistance of the phosphate coating is high, the film builds

up to a thickness at which the resistance of the coating stops further deposit. Thus, a uniform coating is distributed over the surface of the metal piece. While this type coating makes an excellent bond with paint, it has the limitation of all phosphate coatings in that it is somewhat brittle.

Still another rust proofing method is the chrome treatment. With this process great care in cleaning is not required. Briefly, the procedure consists of wetting the metal surface with the rust proofing solution after the part has been cleaned. Then, more solution is applied by dipping or spraying followed by a rinsing, then a drying operation. When dried, the treated surface is rubbed with a tack rag and the piece is prepared for application of lacquer or enamel. Low cost and flexibility of the protective coating are some advantages of the method.

Automotive Materials

NEW DEVELOPMENTS

High-Strength Permanent Magnet Alloy Made of Nickel, Aluminum, Cobalt and Iron

Some details on the properties of Alnico, a new high-strength permanent magnet alloy manufactured by Continental Motors Corp., Detroit, have been reported. Comparisons with other permanent magnet materials such as tungsten steel or iron alloyed with 36 per cent cobalt indicate Alnico to be superior in magnetic strength and permanence than either of these materials, and less expensive than the cobalt steel. The new alloy has a coercive force of 450 to 500 oersteds, the 36 per cent cobalt steel having 240 oersteds and the tungsten steel 70. Total available magnetic energy in Alnico is over 1,400,000 as compared with 860,000 for the 36 per cent cobalt steel and 320,000 for the tungsten steel.

Magnets made of Alnico are less subject to demagnetization by stray fields, retaining over 80 per cent original magnetism after subjection to an alternating current field of 600 amp. turns per in., whereas tungsten steel loses its magnetism completely in a field of 300 amp. turns per in.

Exposure to a temperature of 1100 deg. F. reduces the strength of Alnico less than 20 per cent. At this tem-

perature steel loses virtually all of its strength and 36 per cent cobalt loses 80 per cent. Vibration also has less effect on Alnico than on other permanent magnet alloys.

The new alloy is very hard and must be cast to shape. Plain surfaces may be ground and soft steel inserts or small cored holes included in the castings for supporting and fastening. It has a density of 0.254 lb. per cu. in. as compared with 0.282 for steel.

New Rubberizing Compound Requires No Primer

For the protection of metal or other surfaces against corrosion, the Self-Vulcanizing Rubber Co., Chicago, has developed a rubber compound which incorporates the quality of a primer with a self-curing, cold-curing rubber. The new product, called Selfvulc Insulator, can be applied by dipping, spraying or by hand brushing.

The new rubberizing compound is said to make a steadfast bond in one application; additional coats to build up to any desired thickness may be applied. A vulcanizing period of one hour is required for each coating. According to the manufacturer there is practically no shrinkage in application, the product being 90 per cent pure rubber.

Alloy Steel Containing Included Graphite Has Desirable Properties of Cast Iron and Strength of Steel

Graphitic steel, a new alloy in which part of the contained carbon is present in the form of free graphite, has been developed by the Timken Steel and Tube Division of the Timken Roller Bearing Co., Canton, Ohio. The new product is reported to have properties which make it particularly suitable for use in the tool and die industry.

Advantages claimed for graphitic steel are: ease of hot forging and rolling at temperatures under 2000 deg. F., good machinability due to presence of free graphite, high surface hardness by simple heat treatment, high wear resistance, and high repeated impact resistance. It may be welded by the resistance flash method and after welding, as the graphitic steel will air harden during cooling, a normalizing or annealing treatment is recommended to relieve the internal stresses.

The new steel is produced as a water hardening and as an oil hardening graphitic steel under the trade-marks Graph-sil and Graph-mo, respectively. The former is limited in application to sections which are reasonably uniform and on which sufficient material can be left for machining or grinding to finish

dimensions after heat treatment. The Graph-mo steel has been developed for production of dies and tools which are non-uniform in section and which must emerge from the heat treatment operation without appreciable change in dimension. This steel responds readily to heat treatment from a relatively low temperature and possesses improved physical properties without loss of free machining characteristics.

Both grades of graphitic steel are suitable for dies used in cold working and shaping steel, brass, Dow metal, aluminum, paper, and bronze.

Use of New Flux Recommended in Gas-Welding of Aluminum Bronze

Aluminum bronzes always have been difficult to weld, owing to the effect of the flame on the welding metal, which may greatly change its properties. Heat treatment has an important influence on aluminum bronzes. Among the chief difficulties encountered is oxidation of the metal at the temperature of fusion. If it is desired to effect a sound weld by means of a gas flame, it is necessary either to remove the coating of aluminum oxide formed mechanically at the moment when fusion takes place, or else to destroy it chemically by the use of suitable fluxes.

The subject was discussed in a paper presented at the XII International Congress of Acetylene and Gas Welding in London by M. A. Boutté. According to this author, if the fluxes which have been used for this purpose so far have not been entirely satisfactory, it must be ascribed to their composition, in which has been incorporated either a sulfate, a carbonate or a borate of sodium, these being alkaline oxidizing agents. The aluminum, in the presence of these oxidizing agents and by reason of its affinity for oxygen, is attacked, becomes oxidized and reduces the salts. It follows that the use of such fluxes promotes oxidation of the aluminum component of the alloy and, therefore, increases the difficulties encountered in the course of the welding operation.

M. Boutté recommends a new flux in which all alkaline oxidizing agents have been eliminated, for the reasons given. Only fluorides are used, the particularly active agent of which is cryolite, a fluoride of aluminum and sodium, which is capable of dissolving up to 21 per cent of its weight of aluminum oxide. Fluoride of sodium is added to the cryolite in order to control the melting temperature of the flux, which is made 1740 deg. F. or about 200 deg. lower than the melting temperature of the aluminum bronze.

The use of cryolite has been strongly condemned by founders, who fear that the metal may be corroded by inclusions. It is not always true, observes M. Boutté, that what applies in the foundry is equally applicable in welding, as the conditions of use are entirely different.

A study of numerous micrographs of such welds, made on sheet varying in thickness from 0.020 to 1 in., has never revealed any such inclusions. On the other hand, it has been found that if the weld metal used is of the same composition as the base metal, the welding operation will lower its aluminum content by about 1 per cent. Therefore, the weld metal should have an aluminum content slightly higher than that of the base metal, to make up for this loss by oxidation.

The welding operation is further facilitated by increasing the reducing character of the oxy-acetylene flame by adjusting the torch purposely so as to deliver an excess of acetylene.

Machinable Magnet Steels of Great Rigidity Produced by Sintering Process

Permanent magnets can now be made by the sintering process. These magnets are composed of iron, nickel and aluminum, and they may also contain cobalt. All of these metals are prepared in the form of powders, and the sintering process transforms the

mixture into a hard and tenacious mass.

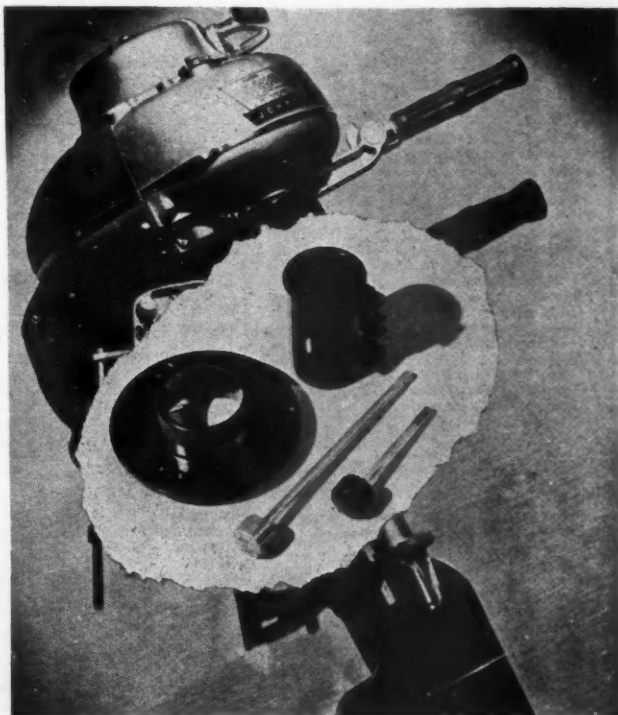
According to M. Oswald, writing in Paul Pascal's "*Traité de Chimie Minérale*," many different pulverulent materials may be agglomerated, either by heating them under such conditions that no actual fusion of any of the constituents can take place; by compression, or by combining the processes of heating and compression, the compression being effected first or simultaneously with the heating. None of the material must pass into the liquid state. This process is known as sintering.

Sintering, which at first was confined to the ceramic industry, has gained in importance during the past half century and bids fair to become a special branch of metallurgy, permitting of obtaining alloys or pseudo alloys, as well as solid masses of pure metal, wherever their preparation by conventional methods would be impractical or too difficult.

Every material, provided it is stable up to sufficiently high temperatures, may be agglomerated by sintering. This is true whatever the chemical composition may be, and applies to elements, mineral or organic compounds, crystalloids and colloids. The manufacture of camphor balls by compression is a sintering, or fritting, process.

According to Skaupy, for a given powder the cohesion produced by compression increases with both the pressure applied and the time of applica-

Parts molded of Durez, a product of General Plastics, Inc., are now being used in Johnson outboard motors. Both the distributor and the coil tube are made of Durez to prevent shorting and carbon tracking from moisture conditions, as well as to prevent faulty functioning due to corrosion. The choke knob is also molded, and it is reported that other outboard motor parts will soon be made of molded materials



tion. As a rule, several successive compressions, without intermediate collapse, are more effective, even if the total time of application of pressure is the same, than a single compression under the same maximum pressure.

Other things being equal, the cohesion, which is checked by means of apparent-density tests, transverse tests, tensile tests, torsion tests and measurements of electrical resistance, increases with the temperature of compression. This growth in cohesion is quite slow at first, then becomes more rapid, and tends toward a maximum corresponding to the cohesion of the molten metal or alloy, even for temperatures of compression far below that at which fusion begins.

According to a French patent (No. 799,798) recently issued to the French Thomson-Houston Co., it has often been attempted to obtain, by the sintering process, metallic objects containing aluminum. Unfortunately, these attempts always failed, because the aluminum powder is always covered with alumina (aluminum oxide) which prevents agglomeration. Thus a mixture of iron, nickel and aluminum, when compressed in a mold and then sintered, does not give a tenacious product, even when the sintering is

effected in an atmosphere of hydrogen specially purified and dried. There is a mass growth or mass increase which is due to the great affinity of aluminum for oxygen.

By means of the Thomson-Houston process, a hard and tenacious alloy can be produced by sintering, as well as permanent magnets which are machinable, by reason of their fine grain and their ductility. First a fragile iron-aluminum alloy is prepared, in which is incorporated the total quantity of aluminum desired in the final alloy, preferably with an equal weight of iron. The alloy may be prepared in an induction furnace, for instance, and after being melted, poured into graphite or other crucibles. After cooling it is ground fine. The other components of the final alloy (iron and nickel or iron, nickel and cobalt) are now added. The preferred composition is 65 per cent iron, 25 per cent nickel and 10 per cent aluminum.

The powders are mixed by grinding them together in a ball-type grinder for about five hours; they are then molded under pressure to give them the desired form, a steel mold being used. Next they are sintered by heating (or "cooking") for several hours, five hours, for instance, at a temperature

of between 2200 and 2550 deg. F. The sintering process is carried out in a reducing atmosphere maintained by a current of pure, dry hydrogen.

Once the material has been sintered to a hard and tenacious mass, it is normalized by heating for about two hours at about 1925 deg. F. From this normalizing temperature the alloy is cooled in still air, but under certain conditions it is found preferable to accelerate the cooling operation by using a current of air. The cooling operation may also be retarded by placing a number of bars together. To a certain extent the optimum rate of cooling depends on the constitution of the alloy; for instance, if it contains cobalt, the cooling should be effected at a slower rate than if the alloy contains only iron, nickel and aluminum. Moreover, for permanent magnets of large cross section it is found advantageous to cool in a blast of air, while those of small cross section are preferably cooled in still air.

By means of the method described it has been found possible to produce sintered magnet steels of great rigidity without fragility and which are machinable to the extent that they can be reduced to very thin sections.—*Revue de l'Aluminium.*

Ferrous Metals Used In Engine Construction

This Table Has Been Prepared From Data Included In "Aircraft Engine Materials," A Paper Presented At The Last SAE Annual Meeting By J. B. Johnson

APPLICATION	S. A. E. No. or TRADE DESIGNATION	MECHANICAL PROPERTIES				CHEMICAL COMPOSITION
		Tensile Strength Lbs. per Sq. In.	Yield Strength Lbs. per Sq. In.	Elongation 2 in. Per Cent	Reduction in Area Per Cent	
Ferrules, clips, lock wire	1010	38,000	20,000	35	..	C, 0.05; Mn, 0.45
Camshaft, washers, ball ends	1015	45,000	25,000	22	..	C, 0.15; Mn, 0.45
Nuts, screws, counterweights, flanges	1020	55,000	36,000	22	..	C, 0.20; Mn, 0.45
Shafts, sleeves, nuts, rivets	1035	80,000	50,000	20	..	C, 0.35; Mn, 0.65
Cylinder barrels, keys	1050	100,000	75,000	16	..	C, 0.50; Mn, 0.65
Springs	1090	225,000	to 350,000	..	..	C, 0.90; Mn, 0.35
Shims, wearing parts, valve mechanism	1095	..	..	..	..	C, 0.95; Mn, 0.35
Screws, nuts, dowels for minor attachments	1120	55,000	..	..	..	C, 0.20; Mn, 0.75; S, 0.11
Bolts, studs, nuts, shafts	2330	125,000	100,000	15	50	C, 0.30; Mn, 0.65; Ni, 3.5
Connecting rods, gears	2340	135,000	110,000	15	50	C, 0.40; Mn, 0.65; Ni, 3.5
Gears, piston pins	3115	130,000	90,000	16	40	C, 0.15; Mn, 0.45; Ni, 1.25; Cr, 0.60
Bolts, studs, shafts	x-3140	130,000	100,000	17	50	C, 0.40; Mn, 0.75; Ni, 1.25; Cr, 0.80
Crankshaft, drive shafts	3240	135,000	110,000	15	50	C, 0.40; Mn, 0.45; Ni, 1.75; Cr, 1.10
Gears, pins	3250	225,000	200,000	10	40	C, 0.50; Mn, 0.45; Ni, 1.75; Cr, 1.10
Gears, cams, crankshaft	2515	170,000	145,000	14	45	C, 0.15; Mn, 0.45; Ni, 5.00
Gears, drive shafts, cams	3312	160,000	135,000	15	50	C, 0.12; Mn, 0.45; Ni, 3.50; Cr, 1.80
Washers, shims, spacers, tubes	x-4130	95,000	75,000	12	..	C, 0.30; Mn, 0.50; Cr, 0.95; Mo, 0.2
Crankshaft, connecting rods	4340	160,000	140,000	15	50	C, 0.40; Mn, 0.65; Ni, 1.75; Cr, 0.70; Mo, 0.35
Balls, bearings, knuckle pins	52100	..	..	..	..	C, 1.0; Mn, 0.30; Cr, 1.35
Gears, shafts, propeller hubs	6135	150,000	120,000	15	50	C, 0.35; Mn, 0.75; Cr, 0.95; V, 0.2
Piston pins, gears, drive shafts, tappets, springs	6150	220,000	200,000	10	..	C, 0.50; Mn, 0.75; Cr, 0.95; V, 0.2
Ball ends, dowels, tappets, bolts, studs	6190	..	..	..	..	C, 0.90; Mn, 0.35; Cr, 0.90; V, 0.2
Gears, cylinders	Nitralloy	135,000	100,000	18	55	C, 0.45; Mn, 0.55; Cr, 1.6; Mo, 0.4; Al, 1.2
Piston pins, shafts, pump liners, bushings	Nitralloy	120,000	80,000	15	45	C, 0.35; Mn, 0.45; Cr, 1.2; Mo, 0.2; Al, 1.2
Exhaust manifolds, supercharger casing	30905	100,000	35,000	40	..	C, 0.07; Mn, 0.45; Ni, 7.0; Cr, 17; Ti, 0.2
Valve, inlet	71360	55,000 (1)	..	..	..	C, 0.60; Mn, 0.3; Cr, 3.5; W, 13
Valve, inlet tips	71665	60,000 (1)	..	..	..	C, 0.65; Mn, 0.3; Cr, 3.5; W, 16
Valves inlet	Cr-Si-W	50,000 (1)	..	..	..	C, 0.45; Mn, 0.40; Si, 3.0; Cr, 8.0; Mo, 1.5
Valves inlet	Cr-Ni-Si	60,000 (1)	..	..	..	C, 0.30; Mn, 0.30; Si, 2.50; Ni, 8.0; Cr, 12.5
Valves, inlet and exhaust, supercharger buckets	Cr-Ni-W-Si	80,000 (1)	..	..	..	C, 0.45; Mn, 0.50; Si, 1.25; Ni, 14.0; Cr, 14.0; W, 2.5
Valves, inlet and exhaust	Cr-Si-Mo	50,000 (1)	..	..	..	C, 1.20; Mn, 0.50; Si, 1.2; Cr, 18; Mo, 0.6
Valves, exhaust	Co-Cr	60,000 (1)	..	..	..	C, 1.2; Mn, 0.50; Si, 0.5; Cr, 13; Mo, 0.9; Co, 1.3
Valves, exhaust	13.5 Cr.	50,000 (1)	..	..	..	C, 1.0; Mn, 0.50; Si, 1.5; Ni, 0.6; Cr, 13.5; W, 3.5; Mo, 0.6

1) Tensile strength at 1200 deg. Fahr.—All other tensile properties are typical specification values

Transparent Molding Resins Available in Light Colors

Pure phenolic compounds without fillers are being offered by the Universal Plastics Corp., New York. The new molding resins are transparent, available in many colors, and molded in the same manner—with molding cycles of about the same length—as the filled phenolics. The materials, trademarked, Uniplast, are also available in translucent and mottled effects. These same effects can be produced by mixing the dry compounds with dry pigments or metallic powders.

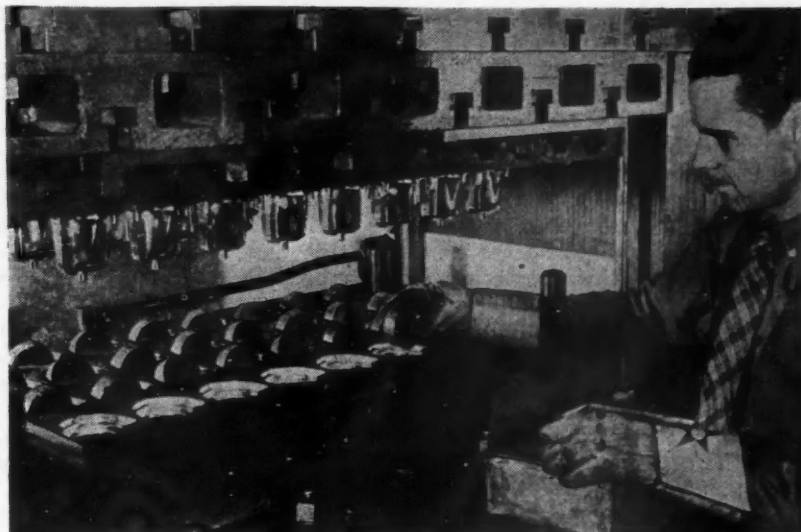
Uniplast parts set and harden permanently in the mold, requiring no cooling in the mold. Molding pressures are about 2000 to 2500 lb. per sq. in. as with ordinary phenolics, but molding temperatures are lower, usually about 300 to 315 deg. F. If the mold is polished, little or no polishing of the molded part is necessary.

Clear water-white material is not available, but transparent shades the color of light amber are produced, as are nearly all darker shades. By addition of dyes or pigments, sometimes combined with fillers, the resin makes either translucent or opaque compounds for molding into objects of any color save white and very light hues. Parts made of Uniplast require no machining to size, are non-flammable, and are not easily broken.

According to data supplied by the makers, the material has the following properties: Specific gravity, 1.27; warpage and shrinkage, none; water absorption, low; effect of aging, none; effect of light, almost none; effect of weak acids, weak alkalis and many common solvents, none.

In England it has recently been announced that the Beetle Products Co., Ltd., a division of British Industrial Plastics, Ltd., London, is making transparent molding compounds of the urea type on a commercial scale for the first time. As the urea resins in pure form are water white, it is assumed (in the absence of detailed announcements) that water-white or at least very light tints in these transparent compounds will become available for molding purposes shortly, in England.

Heretofore, urea plastics have been made for molding purposes with fillers, usually alpha cellulose or its equivalent. These fillers, being translucent, yielded translucent moldings when mixed with the pure resin and were molded in about the same way as phenolic compounds. The chief use of such urea compounds has been in white or light-tinted translucent moldings, some automotive applications being dome-light lenses, instrument dials and knobs.



About 15,000 lb. of plastic materials are required daily for molded parts used in Ford and Lincoln-Zephyr cars. The molding machine shown here is being charged with preforms of soya plastics to be formed into ignition-coil cases. Ford is manufacturing soya plastics to the extent of approximately 20 per cent of the company's present requirements. Small quantities of this plastic are purchased from the Bakelite Corp. which makes, in addition, a large quantity of the commoner form of "straight" phenolic plastics used to produce a majority of the plastic parts employed in the modern Ford cars.

Ford laboratories are conducting experimental work with benzyl cellulose, a plastic in which the cellulose is obtained from the stalk of the soya-bean plant. This is said to yield a more flexible material than the present soya plastic and to lend itself better to manufacture in light colors.

In this country, the principal makers of urea plastics are the Plaskon Corp. and the Beetle Products Division of the American Cyanamid Co. The latter has affiliations with the British company named above. It has not been announced whether transparent urea molding compounds will be made available in this country. There was, however a recent announcement that the Beetle and Plaskon interests here had each been granted licenses under the other's American patents, thus ending litigation in progress for several years.

Simplified Testing for Control of Cyanide, Cadmium, and Zinc Plating Solutions.

A brief review of electroplating, discussing the need for scientific control, is presented in a bulletin, "Solution Control for Electroplating," which has recently been issued by the Grasselli Chemicals Department of E. I. duPont de Nemours & Co., Wilmington, Del. The publication also contains descriptions of simplified testing equipment

for detecting composition irregularities in cyanide, cadmium, and zinc plating solutions. Free copies may be obtained from the editorial department, AUTOMOTIVE INDUSTRIES.

Nickel Alloyed Cast Irons for Automobile Forming Dies

The increasing use of nickel alloyed cast irons as material for automobile body forming dies is pointed out in a recent issue of Nickel Cast Iron News, published by the International Nickel Co., Inc., New York. A typical die iron, now being specified for the body dies of several well-known cars, is an alloy marketed under the trade name Lectorcast. The alloy is produced in an electric furnace from a charge containing a high percentage of steel scrap and within the following composition range:

Total carbon	.....2.90 to 3.00 per cent
Manganese	.....0.60 to 0.70 per cent
Silicon	.....1.25 to 1.50 per cent
Chromium	.....0.60 to 0.80 per cent
Nickel	.....2.50 to 2.75 per cent

Tensile strength approximates 48,000 lb. per sq. in. and uniform Brinell

hardnesses of better than 230 are said to be obtained on the working surfaces in the "as cast" condition. This is naturally a desirable characteristic as the bulk of the castings precludes hardening by heat treatment.

The hardness and uniformity of grain structure of the dies enable them to assume a high polish in service. Hence, undesirable scratches on the surface of the drawn sheet are minimized, and deeper and more difficult draws are possible. Higher resistance to abrasion, claimed to be three to six times greater than that of plain gray iron, reduces "time out" for regrinding.

Synthetic Rubber By-product Can Be Converted to Cellulose Lacquer Solvent

According to an abstract from a Russian chemical publication in *Chimie et Industrie*, the butyl alcohol, which is a by-product of synthetic rubber manufactured in Russia, may be converted into ethyl or butyl butyrate. It can also be converted into methyl-ethyl ketone. All of these products, which are used as solvents in the manufacture of cellulose lacquers, do not affect the mechanical properties of the lacquer coating.

It is therefore possible, in the manufacture of lacquers intended for finishing automobiles, to replace a part of the acetates by ethyl or butyl butyrates or by the product of simultaneous oxidation of ethanal and butanal. In the case of cellulose lacquers intended for use on wood and lacquers for brush application, these solvents may replace the acetates completely. Dichlorethane may be used in cellulose lacquers in the proportion of 20 to 25 per cent (of the volatile constituents). However, its addition increases the viscosity of the lacquer.

New Glass Made of Plastic Materials Obtained by Polymerization of Organic Substances

Safety glass originally consisted of a sheet of nitrocellulose sandwiched between two plates of glass. Since then the nitrocellulose has been replaced by acetylcellulose and more recently by plastic materials obtained by the polymerization of organic materials.

O. Rohm, writing in *Chemische Fabrik*, says he has found other polymerized and very durable materials that can be used without being protected by glass plates. One starts with a methylacrylic acid ($\text{CH}_2 = \text{C}(\text{CH}_3) - \text{COOH}$), which has a double bond, whence it derives its property of polymerizing

readily. Its ethers polymerize even more readily. The higher the molecular weight of the alcohol combining with the acid, the softer the resins obtained. Methyl ether, therefore is the hardest.

Methyl ether boils at 212 deg. F., ethyl ether at about 242 deg. and butyl ether at 296 deg. The resins derived from these alcohols begin to soften, respectively, at 167-176, 149-158, and 68 deg.

It is very difficult to carry out the polymerization in such a manner that no bubbles are formed. Special apparatus is required to produce plates that are as transparent as glass, of a thickness of 2 in. and more, measuring 10 ft. by 10 ft.

The so-called "Plexi" glass has a base of methyl ether. It is highly resistant to chemical influences. A plate $\frac{1}{8}$ -in. thick when submerged in water at 68 deg. F. for 24 hours absorbs only 0.17 per cent of water. The glass therefore is practically unaffected by rain or moisture. Concentrated hydrochloric and hydrofluoric acids, diluted nitric and sulfuric acids do not attack it. Organic solvents, such as acetic ether, benzene, chloroform and alcohol dissolve it more or less rapidly. Gasoline and mineral oils and greases, waxes, etc., as well as the microbes due to the putrefaction of vegetable material, have no effect on it.

The specific gravity of "Plexi" glass is only 1.18, as compared with 2.6 for window glass. In view of the excellent physical and chemical qualities of Plexi, it is very suitable for use in automobiles and airplanes. In the case of an airplane having a window surface of 140 sq. ft. of glass of 0.2 thickness, a saving in weight of 62 lb. is effected, and the gain may be further increased by using organic glass of a thickness of 0.10-0.14 in., which permits of the greatest resistance.

As compared with window glass, Plexi has from eight to ten times the resistance to shock. A rifle ball penetrating it will produce only a small hole. On breaking it, one merely obtains a few large pieces without sharp cutting edges. The glass becomes plastic at between 176 and 255 deg. F. It can then be given any desired form. Two pieces may be welded together by means of a solution of methacrylic acid which is later polymerized. The glass can be cut, milled, drilled, etc. Its hardness is only 2-3 on the Mohs scale, which is lower than that of glass; nevertheless, it is very resistant to destructive influences and M. Rohm states he has been using spectacle glasses of Plexi for several years. Scratches are not serious and can, moreover, be easily removed either by hand or with rotating felt disks.

Phenolic Molding Compound Has Power Factor of 0.34 Per Cent

A phenolic molding compound with a power factor (A.S.T.M.) of 0.34 per cent has recently been developed by General Plastics, Inc., North Tonawanda, N. Y. According to the manufacturer, the new product has molding qualities which permit its use for a variety of applications to equipment such as x-ray machines, diathermy apparatus, high frequency measuring and research devices, and short wave radio parts.

Strauss Patent on Stainless Steel Manufacture to Expire

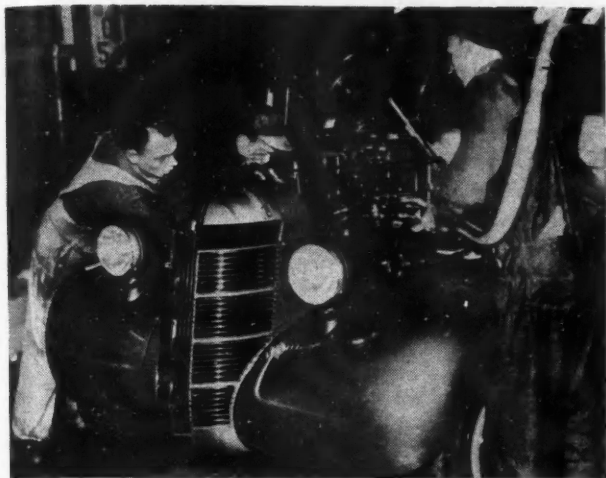
The Strauss patent covering the manufacture of stainless steels, now held by the Chemical Foundation, Inc., will expire May 4, 1937. More than 90 companies licensed under the patent have been paying a royalty of \$13.50 per ton. Despite lifting of this cost it is reported that no widespread reduction of prices is expected, partly due to the large demand for special alloy steels.

Perlton Designed For Economical Case Hardening

Perltonizing is claimed to permit of producing a case depth of from 0.010 to 0.015 in. on 0.30 and 0.40 carbon alloy steels more economically than by cyaniding, to lengthen pot life, minimize fuming, and increase production. The treatment is said to compare favorably in results with the pack-hardening treatment in that a more nearly true carbon case, free from nitriding, is produced.

The supplier of Perlton states that carburization starts within a few minutes after the insertion of a load into the salt bath. The only dead loads being heated are the fixtures upon which the work is hung, or baskets in which the work is inserted. Pot and carburizing salt are up to heat at all times, and having a higher specific heat than cyanide, require less re-firing to hold at an even carburizing temperature.

The next special section in automotive materials will appear in *Automotive Industries*, issue of May 15. PLASTICS, in the Automotive Industry will be the subject of the featured article by Herbert Chase, M.E.



Four men on the Pontiac assembly line. From left to right they put on the drain hose; install the lamp trim; fill the crankcase with oil and install the electric wiring.

Tractors Grow

Big doings are in the offing in the tractor business. Some of the old line manufacturers are in the process of plant expansion to take care of new developments and greatly increased demand. There is no doubt that the Diesel engine has been an important factor in accelerating industrial tractor use and this, in turn, has stimulated fuel economies along other lines. One angle is the use of the Marvel injection system which permits the burning of any available fuel in the same induction system, without appreciable change. Graham-Paige has its hat in the ring with an amazingly successful economy job developed for distribution by Sears Roebuck. And now we learn of a newcomer with an industrial tractor powered by small V-8 engine whose fuel economy may be considered phenomenal so far as tractor experience is concerned, at least in the opinion of its producer. Great days are ahead for the tractor industry.

Die Castings

C. R. Maxon of the New Jersey Zinc Co., earned the applause of an enthusiastic audience at the March 1 meeting of Detroit Section, SAE, for the presentation of a paper entitled, "Die Castings in Automotive Applications." The paper represented a broad survey of the current utilization of zinc die castings, together with some comment on future trends. Discussion centered about several very important points. First it was agreed that the best all-round results may be achieved only when there is complete coopera-

tion between the designer, the die-caster, and the metals producer. Second, it was obvious that zinc die castings have attained a wide acceptance and that applications would grow apace. The consensus seemed to be that the die-cast radiator grilles were here to stay but that, in all probability, the trend would be to the multiple-piece grille rather than the one piece casting.

Cutting Oils

Some short time ago we reported on this page that one of the large parts manufacturers had found it possible to swing many metal cutting operations to soluble oil. Lest we be misunderstood, that report was not intended to mean that soluble oil was the only cutting fluid in use in the plant, since there are machine operations that can be handled best only by cutting oils. In general, it should be noted that the most efficient utilization of cutting fluids demands a study of each operation leading to the adoption of the material best suited. The general tendency today is toward simplification. In some of the largest metal working establishments in the industry, we find that the choice of cutting fluids has been narrowed down to just two types—solubles, and cutting oils.

Gaging Practice

Following many years of intensive work, 33 countries have adopted the international code governing a standard reference temperature for gaging practice. This standard, promulgated in the U. S. by the A.S.A., provides a

Production Lines

reference temperature of 68 deg. F. This, together with the universal adoption of the inch-millimeter ratio 25.4 for industrial measurement, completes a rational standardization of length measurement.

Ease Nerves

Recent news releases quote J. D. Tew, B. F. Goodrich president, to the effect that his company has developed a satisfactory rubber mounting for heavy industrial machinery foundations. One application was tried out on an 80-ton rubber masticator in their Akron plant. This eliminated vibration as well as the threat of damage to the factory floor. Here is a development that holds great promise in metal working establishments in the automotive industry. If it prevents vibration without affecting the alignment of precision machinery, it should promote better product finish, and in addition, will eliminate some of the wear and tear on the human frame.

Saves Metal

Saving ten pounds of raw steel plate per wheel is said to be offered by a new method of producing motor truck disc wheels. The entire process is covered by a patent issued just a matter of days ago. In this process, the inventor proposes the use of strip stock instead of the conventional rectangular blank. Blanks are punched from strip and then formed into wheel discs by simple but unique steps. With the increasing price of steel, the method sounds very interesting for the large producer, since the production of but 200 truck wheels will save a ton of steel.

Decorating Tips

Durez Molder for February has an interesting discussion on the subject of decorative treatments for molded parts. It is of importance to designers and engineers since it points out the pitfalls of certain kinds of treatment as well as the advantages of others.

(Turn to next page, please)

To us, the most important contribution of the article lies in its emphasis upon the need for consulting with the industrial designer when decoration is desired.

Job Standards

A time study engineer in one of the large motor car plants proposes that something should be done pretty quick-

ly about the classification of jobs in the large manufacturing plants. This would lead eventually to a standard job classification recognized by the industry. The real problem arises from the fact that jobs and skills and responsibilities have changed radically in recent years due to the introduction of new production equipment and new techniques. Job classification standards would make it easier to establish

rates of compensation commensurate with the skills involved. In this connection we would recommend a review of the three-volume study published by the U. S. Department of Labor which was mentioned in these columns last year. Despite the natural limitations of the study, it represents considerable effort and should constitute a natural starting point for any new study.

—J. G.

New Continuous Short-Cycle Annealing Equipment for Malleable Castings

A CONTINUOUS, special-atmosphere furnace for scale-free annealing short-cycle malleable castings was recently placed in operation. This furnace, which is of the continuous roller-hearth type, handles 30 tons net per day when operating on a cycle requiring approximately 13 hours in the furnace. We are informed that this installation worked out so successfully that a duplicate plant for the same purpose has already been ordered by the foundry concerned.

The material that goes through this furnace consists of miscellaneous shapes of both small and large castings. The castings are loaded into alloy trays or baskets which travel through the furnace in two parallel rows directly on rollers which serve as the furnace hearth.

The trays are loaded on a loading extension at the charging end of the furnace. After a suitable time interval the charging door of the charging vestibule opens, and an auxiliary high-speed drive mechanism rapidly charges the loaded trays into the vestibule.

This door then closes, the door of the actual heating chamber automatically opens, and the material is conveyed into the heating chamber. The material is then slowly and continuously conveyed through the heating and cooling chambers. On reaching the discharge position, the trays actuate a limit switch, which automatically opens the discharge door, whereupon the material is delivered to a gas-lock chamber or vestibule. This door then closes, and the material is moved out onto a two-tray transfer car and dumping equipment. The empty trays are then placed on a gravity conveyor extending along the side of the furnace, and carried to the charging end, where they are again loaded. The above cycle is then repeated.

The furnace, of course, is built gas tight. A non-oxidizing atmosphere is maintained in the heating and cooling chambers, and the castings when discharged from the furnace are said to be uniformly annealed and absolutely scale-free. The "atmosphere" used in the equipment is produced in an El-furno gas generator located beside the

furnace and which is part of the equipment.

The heating elements are heavy, cast, nickel-chromium alloy grids located in both the roof and bottom of the heating and soaking chambers, above and below the material being heated. They are divided into seven separately and automatically controlled zones.

While the equipment here described is approximately 120 ft. long and is designed to handle 30 tons per day and to operate on a 13-hour cycle, the same type of equipment can be designed for other capacities and other cycle periods. The complete equipment, including furnace, gas generator, dumping equipment, etc., was designed and built by the Electric Furnace Co., Salem, Ohio.

Fig. 1 shows the charging end of the furnace, with two trays of castings ready to be pushed in. Fig. 2 shows the discharge end, and particularly the cooling chamber, discharge vestibule or gas lock, and the two-way transfer car, dumping equipment and gravity-type conveyor at the left for returning the empty trays to the charging end.

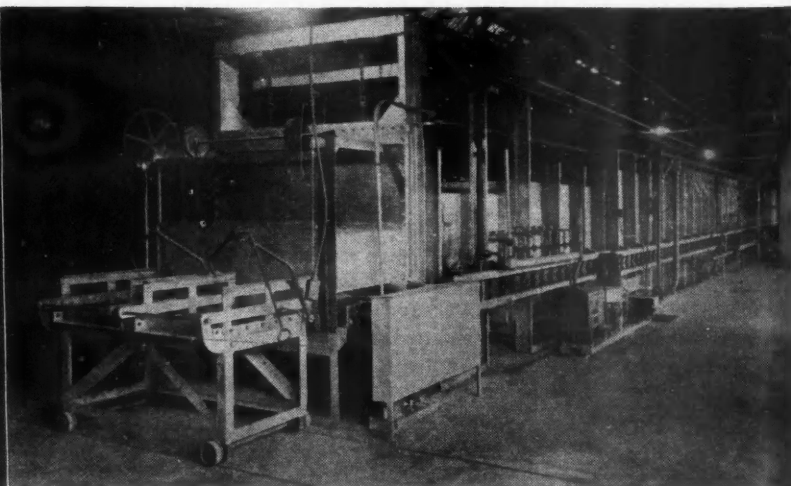
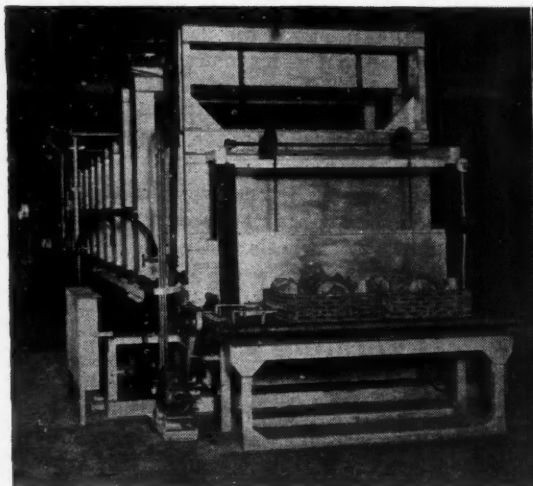
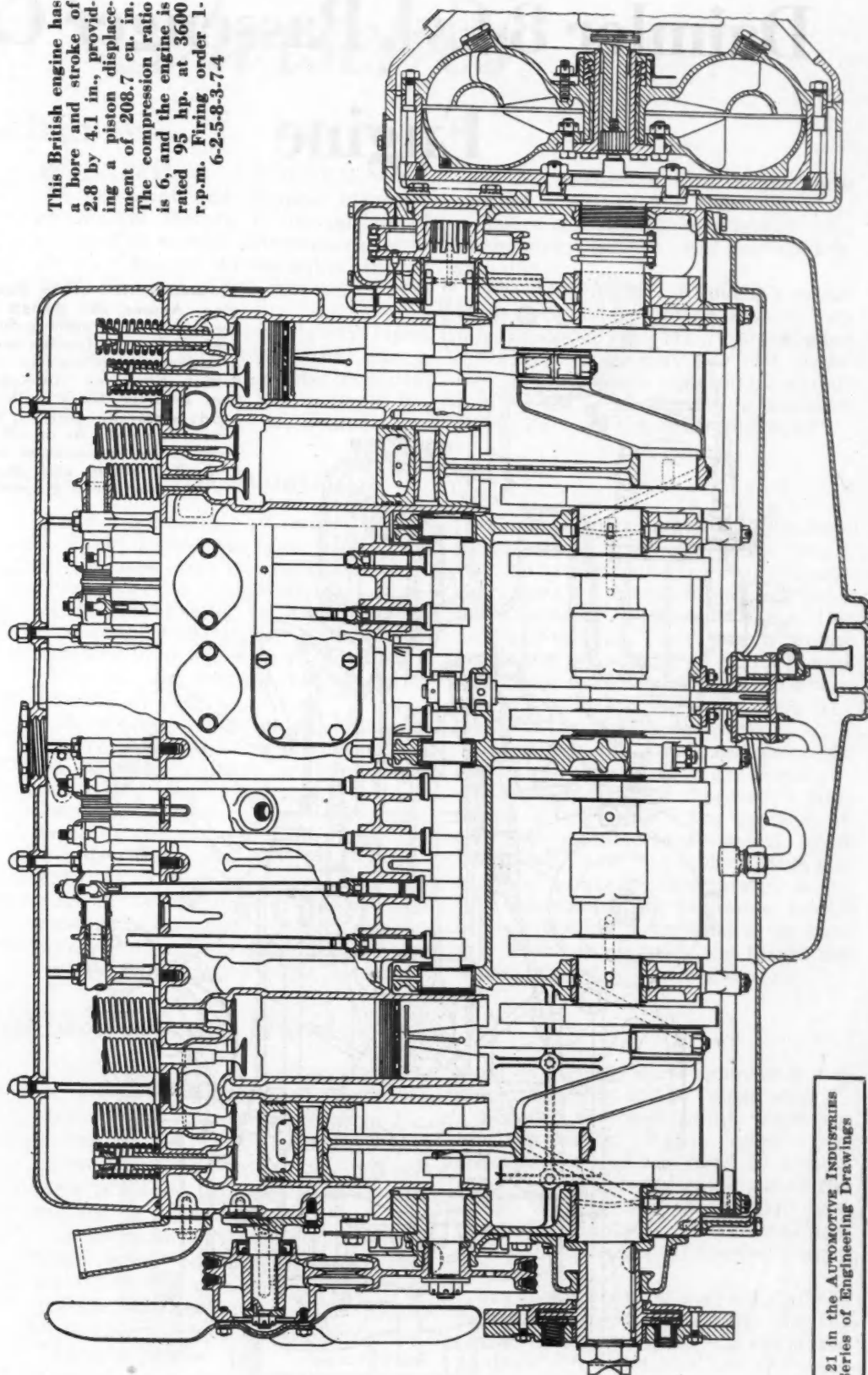


Fig. 1 (left)—Continuous annealing furnace, charging end.

Fig. 2 (right)—Discharge end of furnace, showing discharge vestibule, and two-way transfer car, dumping equipment and gravity-type conveyor at left.

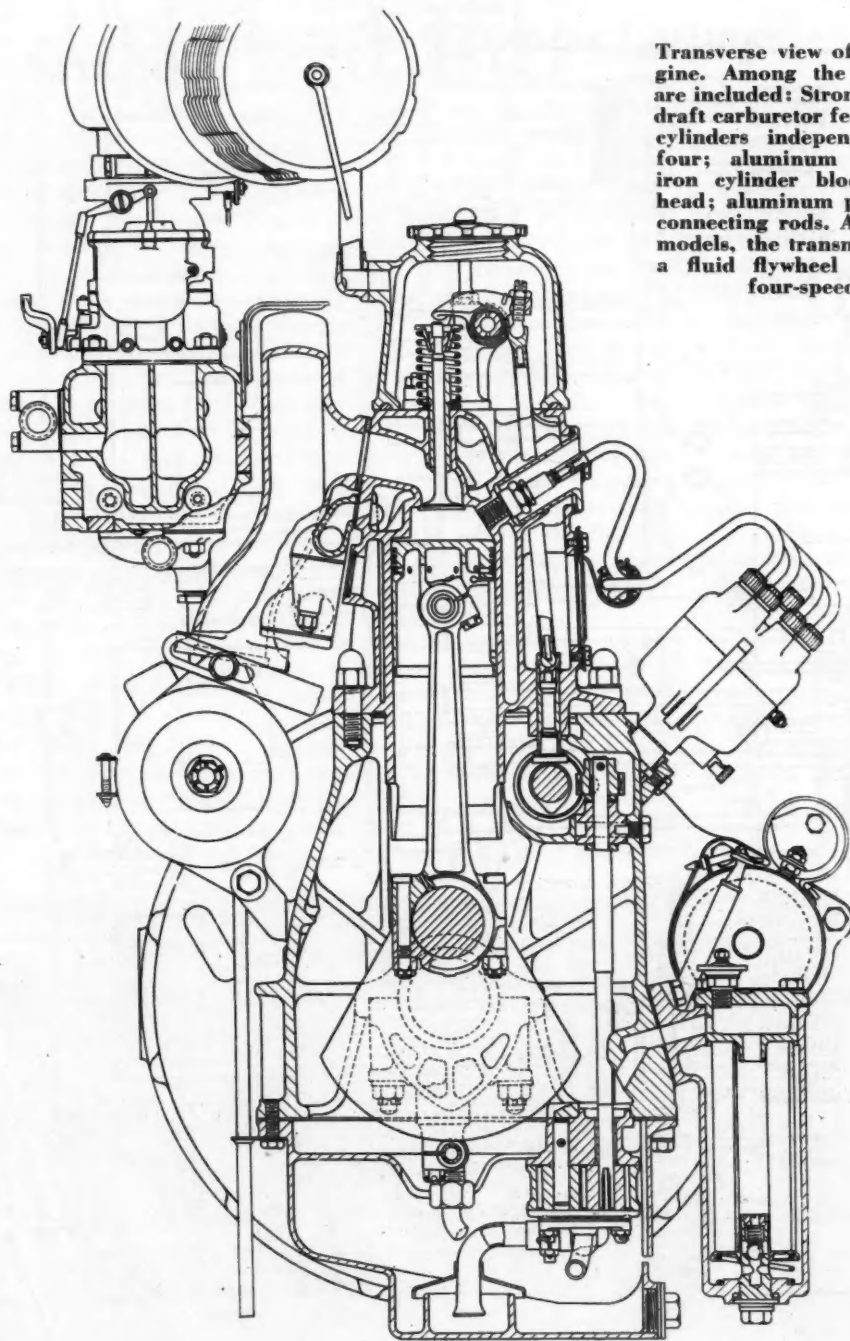
Daimler 8-Cyl. Passenger Car Engine

This British engine has a bore and stroke of 2.8 by 4.1 in., providing a piston displacement of 208.7 cu. in. The compression ratio is 6, and the engine is rated 95 hp. at 3600 r.p.m. Firing order 1-6-2-5-8-3-7-4



No. 21 in the AUTOMOTIVE INDUSTRIES
Series of Engineering Drawings

Daimler 8-Cyl. Passenger Car Engine



Transverse view of the Daimler engine. Among the design features are included: Stromberg dual down-draft carburetor feeding center four cylinders independently of outer four; aluminum crankcase; cast iron cylinder block with integral head; aluminum pistons; and steel connecting rods. As on all Daimler models, the transmission comprises a fluid flywheel and preselective four-speed gearset

Just Among Ourselves

Simple Bigness—

WILLIAM S. KNUDSEN, vice-president and general manager of General Motors, is the subject of a superbly human biographical article by Charles Wertenbaker in the April 17 issue of the *Saturday Evening Post*.

Without submerging his own views entirely, Mr. Wertenbaker has done a good job of catching the essential simplicity of a man who is great because of it, among other definite rea-

sons for assigning him outstanding stature.

There are dozens of quotable bits in the story, but we liked particularly this one.

The "K" in Mr. Knudsen's name isn't designed for emphasis. If you mispronounce it (Mr. Wertenbaker remarks) W. S. may tell you, as he told a woman who insisted on sounding the "K": "Madame, you wouldn't call it kuh-nee action, would you?"

Australian Cars for Australia

THE Australian Commonwealth Tariff Board has been continuing its hearings on "the best means of giving effect to the government's policy of establishing in Australia the manufacture of engines and chassis of motor vehicles, with consideration given to the general national and economic aspect."

Government interest has fastened on the project in Australia because of the expressed opinion that the motor vehicle industry is the greatest labor provider of modern times. Bitterly opposing the government's move are the distributor-assemblers of American and British cars.

As a by-product of the various arguments advanced for and against the government's position there is the view of the *Australasian Manufac-*

turer, that cheap cars of Japanese manufacture will eventually reach the Australian market, to compete with cars of American and British manufacture. Because of this, the publication cited feels that it would be to the advantage of British and American motor vehicle manufacturers to establish complete branch factories in the Commonwealth.

Managers of American assembly plants now operating in the Commonwealth seem to think that such a plan might be workable if the question of complete manufacture backed by a tariff wall, could be removed from the realm of political uncertainty. A future government, for example, might remove the tariff protection, or subsidy which is planned, and throw the whole project to the wolves.

The Public Played a Hand

SETTLEMENT of the recent short-lived sit down strike at the Peoria plant of the Caterpillar Tractor Co. is one of the most instructive and constructive things which immediately preceded the present shaky armistice on the labor front.

Negotiations with CIO representatives were conducted *before* the strike, in the presence of the press and about 100 observers from various departments of the Caterpillar plant. Representatives of management asked the CIO boys some pretty embarrassing question, and the answers

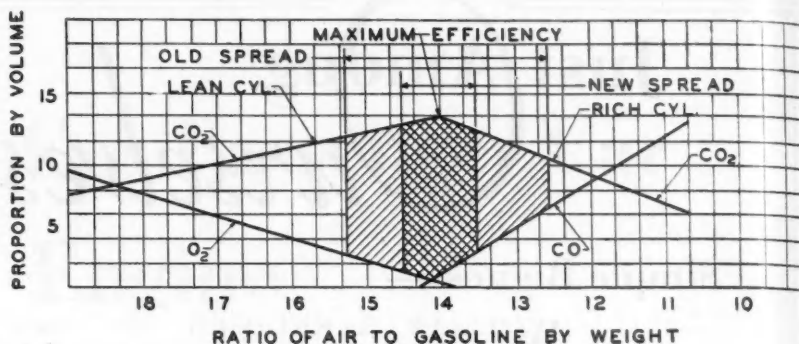
(and evasions) were apparently not too satisfactory to the "observers."

Sensing the way things were going, the Union officials called a sit-down strike and managed to muster a handful of sitters, which closed the plant. With the loss of only two days pay to the employees, a vote was held under the direction of trusted Peoria townsmen.

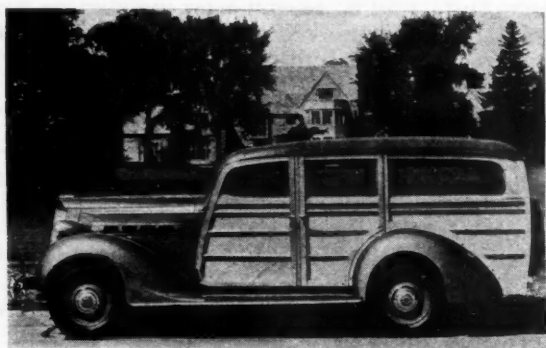
An overwhelming majority of the workers agreed to return to the plants if they were not discriminated against. They did, and the CIO men hastened to sign an agreement drafted by the company.—H. H.

New Fuel Induction System

A NEW fuel induction system for internal-combustion engines has been patented by Continental Motors Corporation and is now used with most Continental engines. By dividing the streams of combustible charge intended for the different cylinders before a horizontal bend is reached in the inlet manifold, uniform delivery of fuel to all cylinders is said to be assured. The split manifold used eliminates the disturbing influence of centrifugal force. Among the advantages claimed to re-



Graph showing the differing efficiencies of the new Continental induction system and older ones



Tego-Bonded Packard Station Wagon body built by Baker Rau Lang Corp.—plywood by Davis Plywood Corp.

TEGO-BONDING

MEANS EXPOSURE-PROOF PLYWOOD

PLYWOOD that is really proof to water, weather and mold has become an established commercial product in the past two years.

Tego-bonding—gluing with dry resin film adhesive—has made the availability of such a material a fact.

Tego-bonded plywood offers not merely improved resistance to moisture and exposure breakdown. It offers permanent assurance against delamination due to glue deterioration, whether from water, climate changes or mold growth.

Tego Resin Film is manufactured by *The Resinous Products and Chemical Company, Inc., Philadelphia, Pa.*

RESINOUS PRODUCTS



sult from the use of this type of manifold are higher thermal efficiency, the possibility of using a higher compression ratio, and greater smoothness of operation.

The accompanying graph shows a comparison of the results obtained with the old and the new system, respectively. The ratio of air to fuel by weight is plotted along the bottom scale, while volume proportions of exhaust-gas constituents are plotted along the scale on the left. The upper inclined lines represent the proportion of carbon dioxide in the exhaust, which reaches a maximum value for a mixture proportion of about 14:1, while the inclined line on the lower left represents the free oxygen in the exhaust and the inclined line on the lower right the carbon monoxide. With the old exhaust system the spread between the mixture ratios of the lean and the rich cylinders is assumed to be from 15.2 to 12.5, while with the new system the spread is only from 14.5 to 13.5. The ideal condition, of course, is to have the mixture giving the maximum proportion of carbon dioxide in all of the cylinders, and the chart indicates that this is much more closely approached with the new than with the old system.

Automotive Research

Kraftfahrtechnische Forschungsarbeiten (Automotive Research Projects), No. 5. Published by VDI Verlag, Berlin NW 7, Dorotheenstrasse 40.

THIS issue of the "Forschungsarbeiten" contains three articles or papers. The first, by P. Riekert and H. Ernst, deals with "The Measurement of Transverse Vibrations in an Automotive Diesel Engine." Records of transverse vibrations were taken from the crankshaft of a four-cylinder, three-bearing engine. A high-frequency recording apparatus was used. The recording apparatus and the hook-up are described in detail. It was impossible to determine any natural frequency of the crankshaft. The deflec-

tions were found to be chiefly the result of variations in the gas pressure.

The second article is entitled "Investigation of a Two-Stroke Engine with Reverse-Flow Scavenging, and is

by A. Reinsch and U. Schmidt. The third article is by the same authors and also deals with investigations on a two-stroke engine, its title being "Scavenging and Fuel Consumption."

gasoline engines, if the lubricant filters were scheduled for a change at 20,000 miles, no serious difficulty was occasioned if it ran along another 10,000 miles before they got around to it. With Diesel engines, owing to the absence of dilution to keep the oil thin, such neglect invariably necessitated the pulling of pistons and a general cleaning and freeing of pistons and rings. Even some bearings were damaged because of clogging of oil lines.

Gradually the company developed a maintenance routine that has given remarkable results. The most recent

The Place of Automotive Oil Engines*

Most people operating gasoline engines have no idea of the amount of dust and dirt passing through the carburetor jets, and if only a small part of this passed through the injection system of a Diesel engine it would ruin the system in short order. Gum and acid in the fuel must also be closely watched. The acid will corrode and damage the pump mechanism, while gums, asphalts and tars will stick pump plungers and injection nozzles so they will not function properly. Waukesha Motor Co. with each of its Hesselman and Comet Diesel engines furnishes a small fuel-oil testing outfit which enables the operator in the field to make a quick check on residue, hard lacquer and gum in the oil.

Diesel engines should not be allowed to run under high torque at low speed, as this is likely to result in stuck piston rings, smoky exhaust, damaged bearings, and scored cylinders. Engines should always be operated in a gear that leaves considerable reserve power for acceleration. When this is done the exhaust will remain clear.

The exhaust is the "pilot light" of the Diesel engine and should be watched. While the average Diesel engine has great "lugging ability," when the speed is reduced to a point where the vehicle will not respond to the throttle, it is best to drop to a lower gear; this does not necessarily result in a reduced average speed, as the engine is likely to speed up 400 or 500 r.p.m. in the lower gear. There is naturally more power available at the higher speeds, as with the relatively flat torque curve of the Diesel the power increases almost in direct proportion to the speed.

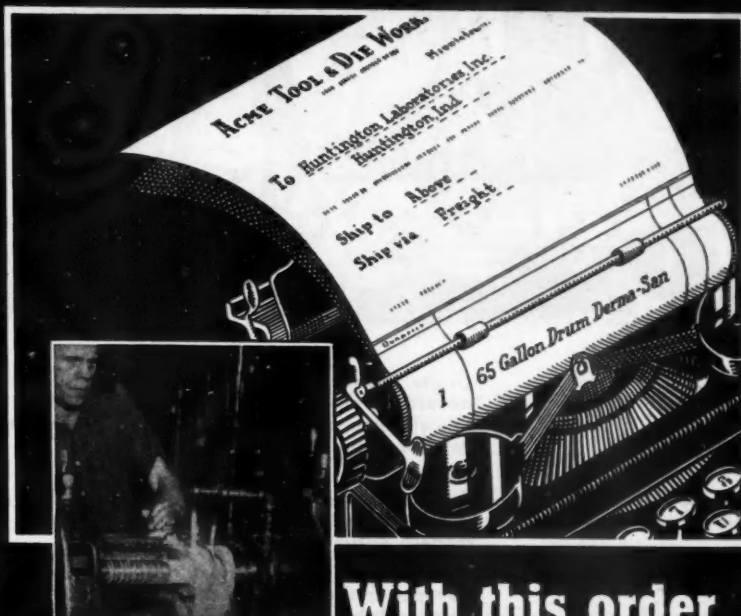
Mr. Campbell in his paper distinguished between two classes of maintenance, preventive and corrective. Under preventive maintenance are grouped the series of daily, weekly or monthly inspections which all good operators give the engines and which lead to the early discovery of little things, immediate correction of which will prevent major failures with long operating delays.

There is probably no more successful large fleet operation committed to Diesel engines than London General

Omnibus. In their early experience they found that the maintenance and inspection that had been applied successfully to gasolines engines were not good enough for Diesel engines. With

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DERMA-SAN IS EXCELLENT FOR ALL GENERAL PLANT SANITATION

* From an S.A.E. paper on "The Economic Place of Automotive Oil Engines," by Arch F. Campbell, Waukesha Motor Co.

record of road failures, that is, complete stoppage of the bus on the highway necessitating calling the service wagon, shows 200,000 miles per road failure for gasoline-engined buses and 400,000 miles per road failure with Diesel-engined buses. A great deal of their success is due to the establishment of a very strict inspection system. They have highway inspectors throughout the metropolitan area who will stop any bus that is smoking excessively and hold it out of service until adjustment has been made. Usually either the fuel pump requires some

minor adjustment or it is a case of stuck rings. The additional cost of this close supervision is not at all prohibitive; it is stated that it is only from 10 to 15 per cent more than similar maintenance on gasoline engines, and this is little compared with the gross saving of Diesel operation.

Mr. Campbell cautioned prospective Diesel operators not to regard the whole difference between the fuel costs of gasoline and Diesel engines as net savings. A part of the saving on fuel should be put back into preventive maintenance. In addition, those about

to change over to Diesel power should be prepared also to meet resistance on the part of the shop foreman and operators to a changed routine. As the organization grows more familiar with Diesel engines, the cost of both preventative and corrective maintenance will decrease.

In all corrective service operations, original standards for clearance and dimensions should be adhered to. Compression spaces of Diesel engines are very small, and this calls for close clearances between the top of the piston and the cylinder head. These clearances must be maintained and must be uniform at all times, and in all cylinders, to assure uniform combustion and smooth operation. When repairs are made, if factory standards are not adhered to, the addition of two or three thousandths here and two or three thousandths there in the fitting and clearances of the piston pin, connecting rod and crankshaft bearings, if they are all in one direction, can materially affect the compression ratio for that cylinder. Excessive wear on piston pins, connecting-rod bearings, and even main bearings will change the clearance between the cylinder head and the piston at the top of its stroke, and these points of wear should be corrected as soon as they are found.

When it is planned to replace the gasoline engines of existing equipment with Diesel engines, it must not be overlooked that owing to the higher torque peaks of the Diesel, heavier clutches, transmissions and drive shafts are needed. Diesel engines have enjoyed really phenomenal success in Europe, where they have been confined in the automotive field to trucks of high tonnage that operate over high mileages. The operators are competent and the equipment is subjected to a regular routine inspection at frequent intervals. In this country there have been a number of failures which in most cases can be traced to incompetent operators.

Comet Diesels are now being built by 18 active licensees in Europe, while four or five additional firms are negotiating for licenses. The largest number have been built by the Associated Equipment Co., in England, about 3000. W. H. Dorman & Co. are close behind the A.E.C., and build a little wider variety of sizes in both four and six-cylinder types. Of course, this production does not compare very favorably with Caterpillar in this country, who have built some 15,000 units of a type of engine running at lower speed and therefore heavier.

Waukesha has built approximately 2500 Hesselman engines ranging from 20 to 350 hp. The company is trying to develop the Comet Diesel for auto-



Then and Now

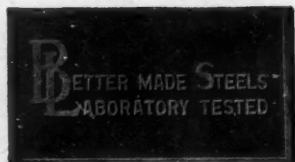
Crude ideas preceded practical reality in the development of the automobile, as pictured by this old-time print indicating an 18th century conception of the "Motor Car of the Future."

The streamline models of today are far beyond the fantastic dreams of the early inventors . . . in beauty, power, speed and endurance . . . a modern miracle in engineering.

Cold Finished Steel has contributed to this great advance in design and construction by providing a dependable and versatile material for building the precision mechanisms of the modern motor car.

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April 17, 1937

Automotive Industries

motive requirements where high ton-nages and long mileages are the rule, and the Hesselman engine for the industrial field, where the operators are not insistent on the high fuel economy of the Diesel engine and are content to be able to burn the cheaper Diesel-type fuel.

Production of Comet Diesel engines has lagged considerably behind that of the Hesselmans, as quite a few problems presented themselves in connection with the former. At present these troubles have been pretty well overcome, and it is contemplated to go into fairly heavy production in the near future. The principal troubles have been with bearings and piston rings. A way has now been found to keep rings from sticking. With rings of rather radical design it has been found possible to operate engines for as long as 2000 hrs. with the rings perfectly free, which under the old conditions would stick in approximately 300 hrs. Thus the problem was solved without forcing the customer to go to a special kind of oil, which was the general remedy in the past.

A rough way of giving the savings of the Diesel and Hesselman engine, according to Mr. Campbell, is by saying that if a gasoline engine uses 6 gals. of fuel per hr., a Hesselman on the same job will use 5 gals., and a Diesel engine, 4 gals. Actually the Hesselman in some cases uses only 4½ gals., this being due to the peculiar characteristic of the Hesselman that it operates most economically at three-quarter load. Nearly all Waukesha Hesselman engines, Mr. Campbell said, will go down to three-quarter load on 0.52 lb. per hp.-hr. and, generally speaking Diesels actually in the field are not showing much better economy than this. Waukesha on some of its own trucks with Hesselman engines in long-distance hauling has obtained 14 miles per gal., where gasoline powered trucks under the same conditions would give about 10 miles and the Diesels 16 or 17.

Automotive Metal Markets

(Continued from page 581)

tion under way. Inadequacy in the supply of primary steel is still an obstacle, but step by step it is being overcome.

Pig Iron—Blast furnace interests report a continuance of heavy demand for second quarter shipments. Quite a few producers are still busy completing their first quarter shipments. The market is strong and unchanged.

Aluminum—The sole domestic producer of primary metal has announced that it is the company's desire to maintain present prices throughout 1937. The market for secondary metals is steady and unchanged.

Copper—Custom smelters marked the price for copper down to 15½ cents late last week and offered metal at that price early this week, primary producers adhering to their 16-cent quotation. Automotive brasses and fabricated copper products are being quoted on the 16-cent basis. A shrinkage in refinery stocks by over 10 per cent at the end of March was considered a bullish factor. Prices abroad were more settled.

Tin—The price of spot Straits tin stood at 60 cents at the beginning of the week, the market turning a shade stronger on Tuesday when the price rose to 60½ cents. Foreign markets are highly erratic.

Zinc—Strike disorders in the ore producing field of Missouri, Kansas and Oklahoma have intensified fears of a lack of normal supplies. The market is steady at 7.35 cents. New York, with premiums reported for spot metal of certain grades.

Wagner Act Upheld

(Continued from page 576)

dissenting opinion was based on this old principle.

The Fruehauf case came to the Supreme Court on appeal of the National Labor Relations Board from the decision of the United States Circuit Court of Appeals for the Sixth Circuit. The lower court dismissed the board's petition asking the court to enforce an order directing the trailer company to cease and desist from discharging any of its employes because of their activities in connection with the United Auto-

WHAT CAN YOU DO WITH A HEATER?



Do you want to sell your car heater for a better price than the cheaper types? Then you've got to make it look different, better, and give it demonstrable sales advantages.

Perhaps Durez can help you do this. Perhaps a molded Durez fan of the turbine type will move more air—more quietly. You can demonstrate this, advertise it, for Durez is non-resonant, and doesn't amplify sound.

Perhaps a molded Durez housing will cost little more than your present metal case . . . and will give your heater new appearance and a chip-proof lustre. It will muffle motor and fan noise, give new sculptural and decorative possibilities.

Or perhaps smart new knobs, handles, controls, of molded Durez will improve its appearance.

DEFROSTERS, TOO.

And if you make defrosters, don't forget that Durez housings are light as a feather, can take unusual shapes, can't scratch. Fans and motor mountings are likewise better when molded of Durez.

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Choice of the Automotive Industry

mobile Workers Federal Union No. 19,375, and to reinstate union members who were discharged. The lower court said the board did not have jurisdiction to issue the order. It pointed out that the manufacture and production of trailers does not directly affect any phase of any interstate commerce in which the trailer company may be engaged. Reference was made to the Supreme Court decision in the Carter Coal Co. case. In that decision it was held that Congress has no power to regulate or control labor relations in coal mining and like application was made to the relations of the trailer company with its employees.

But the Supreme Court held otherwise in the Jones & Laughlin and Fruehauf Trailer Co. cases. Nevertheless, in giving Congress wider control over industry, the majority significantly pointed out that Congress also has wide control over labor or any other source when it obstructs interstate commerce. The question has been raised as to whether the majority was by inference drawing attention to the sitdown strike movement and telling Congress and the Administration to do something about it through the Federal Courts. This would be a sharp departure of the current hands-off policy of Washington, which leaves to Governors the ticklish

job of handling sitdown strikes through local courts. The departure may not be taken by Washington—either the Administration or Congress—because of fear of organized labor power. But plainly the decision makes it clear that labor, when obstructing interstate commerce, can now be readily hauled into Federal courts. Industry quite conceivably will take notice of this phase of the decision and make use of it, possibly to the embarrassment of both Washington and such groups as Lewis' CIO, which have indulged so widely in sitdown strikes and contemptuously scorned local courts and state authorities.

After reviewing the Wagner Act decisions, Nathan Boone Williams, well-known Washington lawyer, long a student of constitutional and industrial questions, made the following comment disclosing interesting possibilities of industry changing operating procedure:

"The real issue presented by these and other recent decisions of the Supreme Court of the United States serves to bring into bold relief the fundamental conflict now disturbing American business and professional thought. That question is whether we are to continue to further centralization of all power over the business and activities of the citizens in the Federal Government and attempt to completely direct such activities from Washington. This is a question of policy which will challenge the best thought of Congress and the country.

"There is now no need to base attempted regulation of business activities on the use of the mails or other means of communication.

"The administration of the anti-trust acts, as amended by the Robinson-Patman Act, the Federal Trade Commission Act, the Securities and Exchange Act, and the Federal Communications Act are much strengthened by these decisions.

"The test appears to be the activities of the business under review and not the separate parts of such business, whether manufacturing or commercial.

"Very likely the instant question will arise as to whether or not and to what degree business enterprises may not find it instantly advisable to separate their manufacturing and sales activities, and possibly purchasing, into separate corporations so as to make plain that their manufacturing operations are in fact local in scope and activity. Many companies now so conduct their operations.

"Franklin K. Lane once said: 'If we did not have states we would have to create them.' Corporate management may no longer hope to either evade or avoid its full responsibility to deal with its problem of employment relations and its relations to both state and Federal Government, frequently in the past neglected, while it has so abundantly met its responsibility to provide a growing volume of goods and services to its customers."



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